Report to the Arlington Redevelopment Board

Recommended Traffic Mitigation
Symmes Redevelopment

Submitted by

Arlington Transportation Advisory Committee

11 April 2005

TAC
Symmes Transportation Subcommittee

Elisabeth Carr-Jones
Jeff Maxtutis
Kevin O'Brien
Scott Smith
Edward Starr (Chair)

Contents

1. Summary of Recommendations (see Section 5)

Task A: Summer Street Corridor

A.1 Redesign Summer/Brattle/Hospital intersection to include signal at Hospital Road. (see Section 3)

A.2 Optimize signal timings at Summer/Mill/Cutter Hill intersection. TAC to specify the goals for the optimization.

A.3 Adopt a phased treatment of the Summer/Grove and Summer/Oak Hill intersections. Phase 1) Traffic calming measures to include refuge islands and crosswalks at Grove and Oak Hill; Phase 2) If needed, signal at Grove Street coordinated with the signal at Summer/Hospital/Brattle.[1]

A.4 Prepare for the possible future installation of a right-turn pocket for westbound traffic turning right from Summer Street to Hospital Road if future studies indicate that it's implementation is of significant benefit.[1]

Task B: Woodside Lane Access

B.1 Permit one-way access into the Symmes site from Woodside Lane.

Task C: Off-Site Roadway Mitigation

C.1 Narrow the entrance to Oak Hill Drive from Summer Street.

C.2 Install curb extensions at Oak Hill Drive and Woodside Lane.

C.3 Install traffic calming device(s) on Oak Hill Drive north of Woodside Lane contingent upon abutter consensus.

C.4 Install stop sign on Woodside Lane at Oak Hill Drive.

C.5 Install curb extensions at Woodside Lane, Vista Circle, Hazel Terrace contingent upon abutter approval.

Task D: Pedestrians and Bicycles

D.1 Install sidewalk on entire length of Hospital Road.

D.2 Install sidewalk on the north side of Summer Street from Hospital Road to Oak Hill Drive.

D.3 Add a crosswalk on Hospital Road at the approach to Summer Street.

D.4 At the Summer/Brattle/Hemlock intersection, add a crosswalk to the Mass Highway plan from the northwest corner of Hemlock to the southeast corner of Brattle.

D.5 Add a sidewalk on the hospital side of Woodside Lane between Hospital Road and

Oak Hill Drive, contingent on abutter consensus.

D.6 Explore improving access to Bikeway via Brattle Place.

D.7 Install a curb cut on the south side of Summer Street behind High School to access Bikeway.

D.8 Install and/or improve sidewalks on west side of upper Hemlock Street between Yerxa and Epping for Stratton Elementary School access.

Task E: Public Transportation

E.1 Encourage a shuttle bus operating from site to Alewife Station and town.

E.2 Encourage working with MBTA to increase Route 67 service to site and area.

E.3 Provide bus stops with rain cover at site and medical office building.

E.4 Encourage tenants of medical office building to employ transportation demand management.

E.5 Encourage unbundling the cost of parking in all leases and purchases.

[1]We are recommending that Phase 1 include Recommendations A.1, A.2, Phase 1 of A.3, C.1, C.2, C.3, and C.4. Following the implementation of Phase 1 by about 12 to 18 months, an evaluation for Phase 2 should be made. Mitigation measures to be evaluated for Phase 2 would include a signal at Grove and Summer, a westbound right turn pocket into Hospital Road, and moving the crosswalk on Summer Street at Hospital Road to the east of Hospital Road. In preparation for the eventuality of Phase 2 mitigations, a conduit should be placed between the signal controller at Hospital Road and the location of the potential signal controller at Grove Street, no structures should be put in place that would preclude the installation of a right turn pocket, and the signal at Hospital Road should be made capable of implementing a pedestrian actuated crossing of Summer Street to the east of Hospital Road.

2. Introduction

At the request of the Arlington Redevelopment Board (ARB), the Board of Selectmen tasked the Transportation Advisory Committee (TAC) in August of 2004 to support the ARB in the consideration of transportation issues with respect to the Symmes Redevelopment project. At the TAC meeting on 24 August, the TAC formed a subcommittee of five members to concentrate on this effort, the Symmes Transportation Subcommittee (STS).

The ARB requested that the TAC manage the peer review of the report prepared by the developer's consultant [ref. 1], Howard Stein-Hudson (HSH), in preparation for the Special Town Meeting to be held on 20 September 2004. This Special Town Meeting was called to consider zoning revisions to accommodate the Symmes development. Gary Hebert of Fay, Spofford & Thorndike (FST) was selected to conduct the peer review, and his report [appendix A] was submitted on 15 September. The STS presented a preliminary transportation evaluation at the Special Town Meeting, based upon the HSH report, the peer review, and its own analyses.

Following the affirmative vote of the Special Town Meeting, the next step in the ARB process is for the developer to apply for a Special Permit as required for the Symmes project. The ARB then performs a thorough evaluation of many things including transportation. To support this evaluation, the STS developed a task plan for conducting this review as described in Section 4. The STS conducted twenty meetings between August 2004 and March 2005. In addition, individual work was required between meetings. There has been neighborhood and developer representation at the majority of our meetings. This report and recommendations are the completion of this effort.

We of the STS would like to thank Symmes Redevelopment Associates for their support, and Jane Howard and Jim Danila of HSH and Gary Hebert of FST for their assistance in the analyses.

Fig 1 illustrates the location of the site and the roadways in the area. Summer Street is currently under reconstruction between the Lexington line and Brattle Street by Mass Highway. Fig 2 illustrates the projected development on the site as of September 2004.

The TAC's approach to the evaluation has been to understand the transportation issues impacting this area of Arlington for the future. This obviously requires understanding the contribution of a major development such as Symmes. Our focus, however, has been the integrated whole, not just the Symmes Redevelopment Project.

3. Impact of the Development

The HSH report [ref. 1] released in September 2004 analyzed the traffic conditions looking forward to 2009 based upon projected general increases in traffic volume and the traffic contribution from the 265 residential units and medical facilities on the Symmes site. Most of the analyses used the Synchro computer analysis, a standard traffic engineering tool.

In Figs 3 and 4, we summarize some of the computer analyses from the HSH report, all projecting to 2009. Fig 3 focuses on the Summer/Brattle/Hemlock intersection, and Fig 4 on the Hospital/

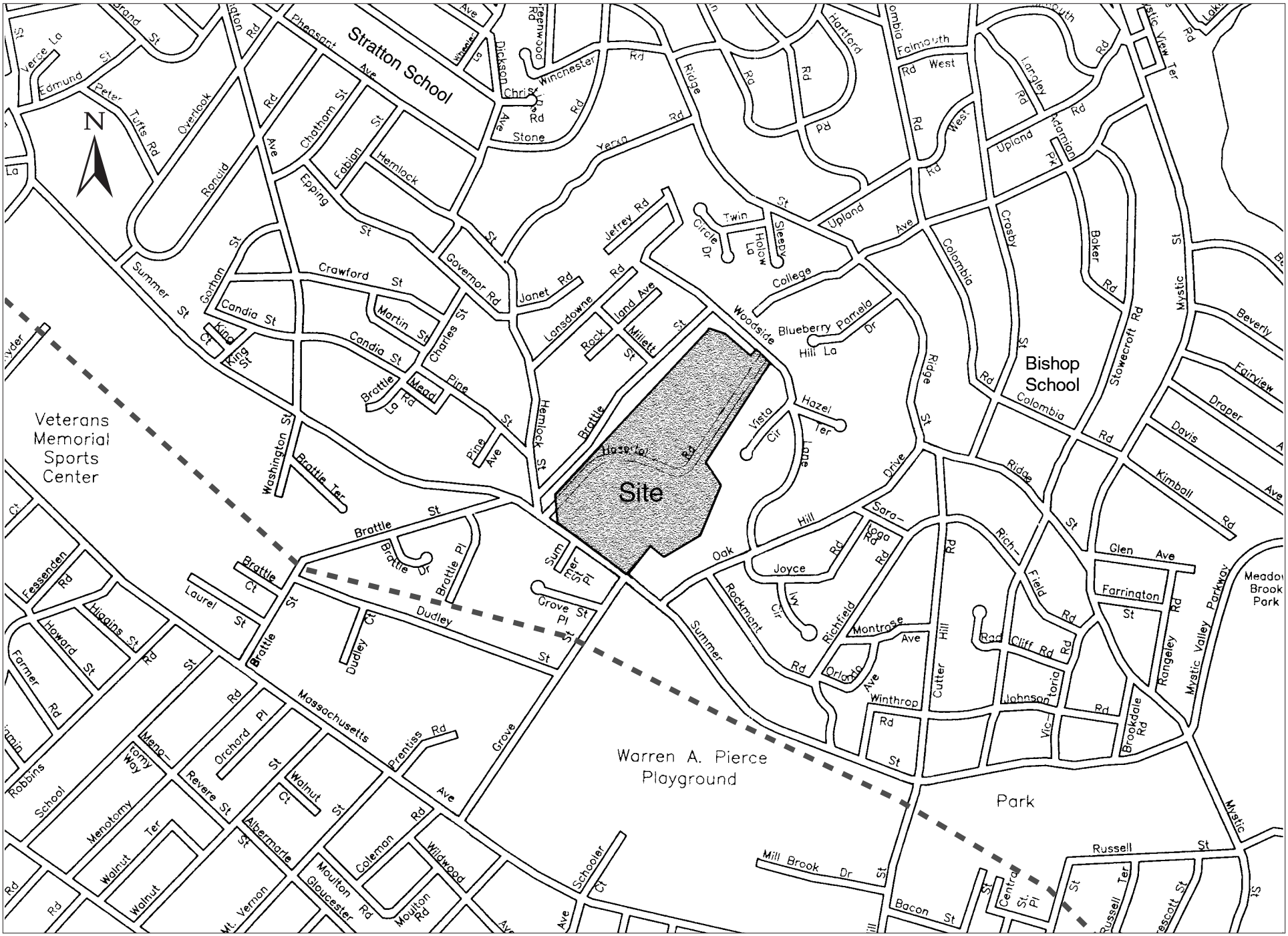


Fig 1 Symmes Area Map

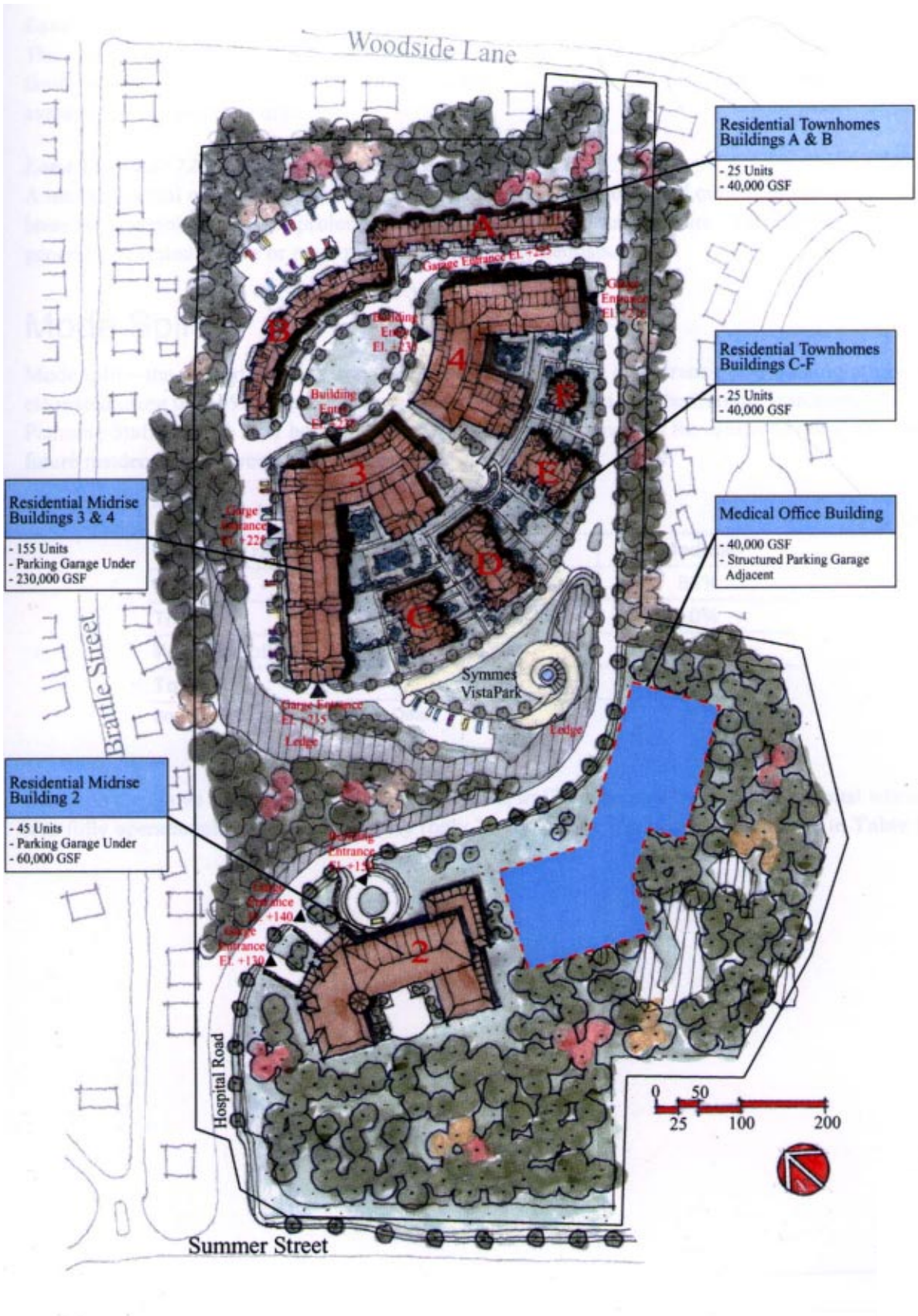


Fig 2 Projected Symmes Development (September 2004)

Summer intersection. Fig 3 shows the projections for 2009 for no development on the site, for the development being completed, and for the development completed with a new signal at Hospital Road and Summer Street.

First we examine the Hospital Road and Summer Street intersection. We observe from Fig 3.1 that with no development on the site, the flow of traffic on Summer Street continues to perform satisfactorily. In fig 3.2, the project is built, but a signal is not installed at the Hospital Road and Summer Street intersection. The flow of traffic on Summer Street continues to work well, but the exit from the developed site via Hospital Road is difficult. Delays for southbound left (SBL) are over 10 minutes in the peak AM hour and over 3 minutes in the peak PM hour. This length of delay would hamper the ability of the developer to sell the properties and would encourage site residents to exit via Woodside Lane. To be successful, the project requires a signal at Hospital Road and Summer Street.

	EBL	EBT	WBT	WBR	SBL	SBR	Total
AM Peak - Volumes		816	769		2	10	1597
Level of Service		**A**			**D**		
delay in sec		0	0		26.3		
queues in ft - 50%		1			5		
-95%							
PM Peak - Volumes	2	662	712	8	11	12	1407
Level of Service		**A**			**E**		
delay in sec		0.1			42.6		
queues in ft - 50%							
-95%							

EBL = eastbound left, EBT = eastbound through, WBT = westbound through, WBR = westbound right, SBL = southbound left, SBR = southbound right

Fig 3.1 Hospital/Summer Intersection (No Build, 2009, no signal at Hospital Road, 3.1% volume increase, Woodside open)

	EBL	EBT	WBT	WBR	SBL	SBR	Total
AM Peak - Volumes	20	761	609	44	56	27	1517
Level of Service		**A**			**F**	**C**	
delay in sec		0.7			754.8	16.6	
queues in ft - 50%		2	0		254	11	
-95%							
PM Peak - Volumes	26	662	712	67	60	34	1561
Level of Service		**A**			**F**	**C**	
delay in sec		0.9	0		208.7	16.3	
queues in ft - 50%		3	0		203	14	
-95%							

Fig 3.2 Hospital/Summer Intersection (Project Built, 2009, no signal at Hospital Rd, 3.1% volume increase, Woodside Open)

HSH has worked with Mass Highway and designed a signal at Hospital Road that is coordinated with the Brattle/Summer Street intersection. The performance of the combined signal is shown in Fig 3.3 with Woodside Lane open and Fig 3.4 with Woodside closed. In both cases the delay exiting Hospital Road SB left is less than 1 minute, and SB right about a minute. We agree with HSH's recommendation of this signal.

Recommendation A.1 Redesign Summer/Brattle/Hospital intersection to include signal at Hospital Road.

	EBL	EBT	WBT	WBR	SBL	SBR	Total
AM Peak - Volumes	20	761	609	44	56	27	1517
Level of Service		**A**	**D**		**D**	**E**	
delay in sec		3.7	36.1		35.2	56.4	
queues in ft - 50%		0	377		52	24	
-95%							
PM Peak - Volumes	26	662	712	67	60	34	1561
Level of Service		**A**	**D**		**D**	**E**	
delay in sec		2	35.4		40.3	63.1	
queues in ft - 50%		0	440		63	35	
-95%		m102	#966		69	58	

m = metered by other intersection,
# = number is approximate, acceptable for the design of storage bays, and valid for comparisons

Fig 3.3 Hospital/Summer Intersection (Project Built, 2009, signal at Hospital Rd coordinated with Hemlock, Mill optimized, 3.1% volume increase, Woodside open)

	EBL	EBT	WBT	WBR	SBL	SBR	Total
AM Peak - Volumes	21	761	609	70	86	27	1574
Level of Service		**A**	**D**		**D**	**E**	
delay in sec		3.5	49.2		35.7	57	
queues in ft - 50%		0	442		83	24	
-95%							
PM Peak - Volumes	27	662	712	100	103	35	1639
Level of Service		**A**	**D**		**D**	**E**	
delay in sec		2.3	47.6		40.3	61.7	
queues in ft - 50%		0	**528**		113	36	
-95%		m81	#1030		109	59	

Fig 3.4 Hospital/Summer Intersection (Project Built, 2009, signal at Hospital Rd coordinated with Hemlock, Mill optimized, 3.1% volume increase, Woodside closed)

The necessary signal at Hospital Road has further impacts. From Fig 4.1, for the Brattle/Summer/ Hemlock intersection without a signal at Hospital Road, we see that eastbound through (EBT) traffic on Summer Street operates at Level of Service (LOS) B in the AM and PM peak hours. With the signal at Hospital Road (Fig 4.2), the LOS for eastbound through traffic on Summer Street in the PM drops from LOS B to LOS D. This is a significant change since the delay increases from 14.6 to 35.5 seconds. Concurrently, westbound through (WBT) traffic improves from LOS C in the AM to LOS B. Other travel directions of the intersection have the same LOS as before.

The Grove and Oak Hill intersections with Summer Street are also impacted by the Hospital Road signal in the following ways: a) the left turn from Grove onto Summer Street (already difficult and the source of 3 crashes per year) would become more difficult, b) pedestrian crossing of Summer Street between Hospital Road and Mill Street would continue to be dangerous, and c) queues from westbound traffic at PM peak hours are projected to occasionally block the Grove Street intersection.

Of course, the development will have other transportation impacts than the Summer Street Corridor. These will include Woodside Lane, Oak Hill Drive, and other local streets. These will be addressed in the following sections.

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Total
AM Peak Volumes LOS delay in sec queues in ft - 50% -95%	12	669 **B** 18.4 222 #684	25	83	619 **C** 23.9 177 #683	58	30	27 **D** 42.8 64 146	59	167 **D** 43.6 84 #210	61 **C** 27.4 36 99	36	1846
PM Peak Volumes LOS delay in sec queues in ft - 50% -95%	25	656 **B** 14.6 240 497	35	68	720 **B** 17 247 #472	105	57	31 **D** 51.4 75 #190	53	60 **C** 30.8 27 68	9 **B** 17.4 4 28	19	1838

Fig. 4.1 Summer/Brattle/Hemlock Intersection (No Build, 2009, no signal at Hospital Road, 3.1% volume increase over Feb 04 measurement, Woodside open)

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Total
AM Peak Volumes LOS delay in sec queues in ft - 50% -95%	12	674 **C** 30.1 314 #736	25	100	628 **B** 12.9 36 #124	58	30	27 **D** 47.8 67 #175	69	167 **D** 41.9 77 #214	61 **C** 24.3 32 90	36	1887
PM Peak Volumes LOS delay in sec queues in ft - 50% -95%	25	665 **D** 35.5 373 #833	35	85	728 **B** 18.6 44 #855	105	57	31 **D** 53.1 94 #227	70	60 **C** 33.1 29 77	9 **B** 18.6 4 31	19	1889

Fig. 4.2 Summer/Brattle/Hemlock Intersection (Project Built, 2009, signal at Hospital Road coordinated with Hemlock, 3.1% volume increase over Feb 04 measurement, Woodside open)

4. Organization of Work

Summer Street is an important major east/west arterial for Arlington and those who commute through Arlington using it. A key to the success of the Symmes project and for the future of Arlington is the operation of the Summer Street Corridor from Brattle Street to Mill Street. If this corridor is operating properly, there will be less congestion, less cut-through traffic into neighborhoods, and increased safety in the area. If the corridor is congested, the development will have less value to prospective owners, and will cause degradation of the quality of life for those using Summer Street and for the neighborhoods around Symmes. For these reasons, the Summer Street Corridor was the first focus of our work (Task A). This was followed by a consideration of the vehicular access to and from the site via Woodside Lane (Task B), and mitigation measures for potentially impacted roadways (Task C).

The availability of transportation alternatives to the automobile is important to the site, and to Arlington. Ensuring that the area is friendly to pedestrian and bicycle use (Task D) and the availability of public transportation (Task E) are also examined and recommendations made.

5. Discussion and Recommendations

In our examination of the Symmes area, we have considered the list of requirements and preferences put forth by the Symmes Advisory Committee in their formal report [ref. 2]. These are cited where applicable.

5.1 TASK A: SUMMER STREET CORRIDOR

5.1.1 Expected Traffic Volumes

The September HSH report [ref. 1] used the traditional measurement and extrapolation technique widely applied by Traffic Engineers to predict future volumes: make a set of measurements and extrapolate the volumes based upon the average increases per year that Mass Highway collects on major throughways in Massachusetts (such as Route 2). Currently this growth is 0.5% per year, or 3.1% total over five years. HSH, FST, and others in the field use this method.

HSH measured an average volume of 15,836 vehicles per day on March 2 and 3 of 2004. To make a projection to 2009 using the standard technique, the measured volume was increased by 3.1% for the five years. The projected volume for 2009 is then 16,327 vehicles per day.

Several measurements have been made on Summer Street over the years, as shown in Table 1. These measurements were all taken between Hospital Road and Grove Street on Summer Street.

Measurement Date and Source	Daily Volume
August 1989 / Marchionda & Associates Thursday 8/17	13,919
October 1998 / FST Wednesday 10/28	18,045
March 2004 / HSH Tuesday 3/2 and Wed 3/3	15,836

Table 1 Measurements on Summer Street between Hospital Road and Grove Street

From Table 1, we note that the increase in volume on Summer Street from 1989 to 2004 is 0.9% per year averaged over 15 years. We also note that the increase in volume from 1989 to 1998 was 2.6% per year. Applying the 0.9% per year increase would yield 4.6% over five years; applying the 2.6% per year would yield a 13.7% increase. These numbers illustrate the dependency of projections on which years are being compared. Projecting traffic volumes 5 years into the future has significant uncertainties that are compounded when broad area averages are used rather than local conditions.

The volume measured in 1998 by FST was higher (18,045) than that projected by HSH for 2009 (16,327). In 1998 the Massachusetts economy was booming and the work on Reeds Brook Park (now McClennen Park) on Summer Street had not yet begun. In 2004, the economy was down, the unemployment rate had not yet recovered, and western Summer Street was impacted by the development of McClennen Park and the Mass Highway project to reconstruct Summer Street from the Lexington line to Brattle Street. There are rational reasons why a measurement in early 2004 might be lower than in 1998. It would not be out of the question for traffic volumes on Summer Street to return to the 1998 level sometime in the next decade.

5.1.2 Robustness to Increased Traffic Volumes

As a roadway approaches its capacity, delays increase exponentially. We wish to ensure that the operation of the Summer Street Corridor does not approach this point. To this end, we requested analyses to be performed at both the 3.1% increase over 5 years and a 10% increase. The 10% increase would bring the level to 17,420 vehicles per day. If these higher volumes illustrated reasonable operation, the corridor could be considered robust in the face of changing conditions.

Fig 5 illustrates the results of this sensitivity analysis. Figs 5.1 and 5.2 compare the analyzed performance at the Brattle/Hemlock/Summer intersection in 2009. We note that for the 10% increase, the westbound through (WBT) and eastbound through (EBT) delays increase only slightly. The level of service is consistent except for the PM peak hour where the WBT drops from a LOS B to a LOS C for both WBT and SBT. This change represents an increased delay from 18.6 sec to 22.5 sec and is a minor increase. This intersection appears to operate well with the 10% increase of traffic.

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Total
AM Peak Volumes Level of Service delay in sec queues in ft - 50% -95%	12	674 **C** 30.1 314 #736	25	100	628 **B** 12.9 36 #124	58	30	27 **D** 47.8 67 #175	69	167 **D** 41.9 77 #214	61 **C** 24.3 32 90	36	1887
PM Peak Volumes Level of Service delay in sec queues in ft - 50% -95%	25	665 **D** 35.5 373 #833	35	85	728 **B** 18.6 44 #855	105	57	31 **D** 53.1 94 #227	70	60 **C** 33.1 29 77	9 **B** 18.6 4 31	19	1889

Fig 5.1 Brattle/Hemlock/Summer Intersection (Project Built, 2009, signal at Hospital Rd coordinated with Hemlock, Mill optimized, 3.1% volume increase, Woodside open)

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Total
AM Peak Volumes Level of Service delay in sec queues in ft - 50% -95%	12	720 **C** 34.6 349 #808	25	100	672 **B** 14.4 40 m#177	58	30	27 **D** 47.7 66 #172	68	167 **D** 41.7 77 #213	61 **C** 24.3 32 90	36	1976
PM Peak Volumes Level of Service delay in sec queues in ft - 50% -95%	25	712 **D** 42.2 417 #910	35	85	779 **C** 22.5 62 #935	105	57	31 **D** 53.1 94 #227	70	60 33.1 29 77	9 **C** 18.6 4 31	19	1987

Fig 5.2 Brattle/Hemlock/Summer Intersection (Project Built, 2009, signal at Hospital Rd coordinated with Hemlock, Mill optimized, 10% volume increase, Woodside open)

Fig 5.3 and 5.4 compare the operation of the Hospital Road and Summer Street intersection. Here again, with a 10% increase the delays increase only slightly, and the level of service is the same.

From this analysis we reach the very important conclusion that the Summer Street Corridor should continue to operate at an acceptable level of service for reasonable future volume increases.

	EBL	EBT	WBT	WBR	SBL	SBR	Total
AM Peak Volumes	20	761	609	44	56	27	1517
Level of Service		**A**	**D**		**D**	**E**	
delay in sec		3.7	36.1		35.2	56.4	
queues in ft - 50%		0	377		52	24	
-95%		#595	#731		61	45	
PM Peak Volumes	26	662	712	67	60	34	1561
Level of Service		**A**	**D**		**D**	**E**	
delay in sec		2	35.4		40.3	63.1	
queues in ft - 50%		0	440		63	35	
-95%		m102	#966		69	58	

Fig 5.3 Hospital/Summer Intersection (Project Built, 2009, signal at Hospital Rd coordinated with Hemlock, Mill optimized, 3.1% volume increase, Woodside open)

	EBL	EBT	WBT	WBR	SBL	SBR	Total
AM Peak Volumes	21	866	804	54	97	47	1889
Level of Service		**A**	**D**		**D**	**E**	
delay in sec		5.1	44.1		35.1	56.4	
queues in ft - 50%		0	422		52	24	
-95%		m#799	#805		61	m45	
PM Peak Volumes	26	723	828	73	103	59	1812
Level of Service		**A**	**D**		**D**	**E**	
delay in sec		2.7	42.9		40.3	62.6	
queues in ft - 50%		0	**492**		63	35	
-95%		m123	#1058		69	58	

Fig 5.4 Hospital/Summer Intersection (Project Built, 2009, signal at Hospital Rd coordinated with Hemlock, Mill optimized, 10% volume increase, Woodside open)

5.1.3 Examination of Corridor Improvements

Several additional configurations were examined for the Summer Street Corridor at AM and PM peak hours, each at 3.1% increase and 10% increase of volumes. Each were analyzed with Woodside Lane open one-way inbound and with Woodside closed. The configurations included: a) additional signals at Summer's intersection with Grove Street and Oak Hill Drive, coordinated with Hospital Road/Brattle Street signal. b) coordination of all signals between Mill Street/Cutter Hill/Summer intersection and Brattle/Summer intersection. c) a signal at Grove Street but not Oak Hill, and d) traffic calming methods at the Grove and Oak Hill intersections with Summer Street.

a. Corridor operation with signals at Grove Street and at Oak Hill

The analyses of the corridor are summarized in Fig 6. Fig 6.1 is eastbound at the AM peak hour and Fig 6.2 is westbound at the PM peak hour.

In these diagrams each intersection is represented by a rectangle. Within the rectangle the traffic volumes for the peak hour in each direction entering the intersection are represented with the LOS if it was given in the analysis. Above the rectangle are the volumes entering and exiting from the street to the north – for example, Hemlock. Below the rectangle are the volumes entering and exiting from the street to the south, for example Brattle. The queues, delays and LOS for the through movement are indicated below the rectangles.

These analyses indicate that the corridor operates satisfactorily at 10% volume, with signals at Grove and Oak Hill, and Mill/Summer optimized but not coordinated. The intersections in this string operate at LOS C-A-A-A-E from east to west in 6.1, and LOS A-A-C-C from west to east in 6.2 (Mill was not analyzed). The LOS E eastbound for the Mill/Summer/Cutter Hill intersection is the same as the current operation in the morning. The only apparent difficulty is the queue westbound in the PM at Hospital Road backing up to and blocking Grove Street. There is 440 ft between the east edge of Hospital Road and the west edge of Grove Street. The 50% probable westbound queue is 530 ft. This will be discussed in a later section when a right turn pocket westbound into Hospital Road is discussed.

b. Coordinating Mill/Summer/Cutter Hill with the other signals

Fig 7 illustrates a sample of the results from analyses of coordination of all signals in the corridor. Fig 7.1 is AM peak hour eastbound without the Mill/Summer intersection added to the coordination, and Fig 7.2 is with it added to the coordination.

Coordinating the Mill/Summer intersection with the other signals makes a little difference to the rest of the corridor, but degrades the performance at Mill/Summer. This coordination does not help and is not recommended.

Fig 6. Operation of the Summer Street Corridor at the AM and PM peak hours (Project Built, 2009, signal at Hospital Rd coordinated with Hemlock, Mill optimized but not coordinated, 10% volume increase, signal at Grove and at Oak Hill, Woodside open one-way)

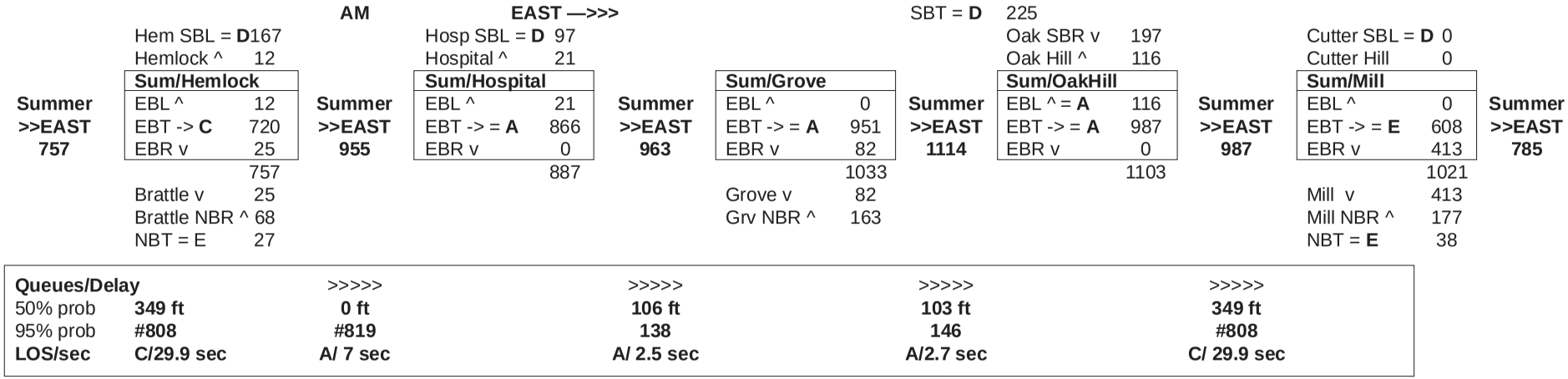


Fig 6.1 Eastbound Corridor at peak AM hour

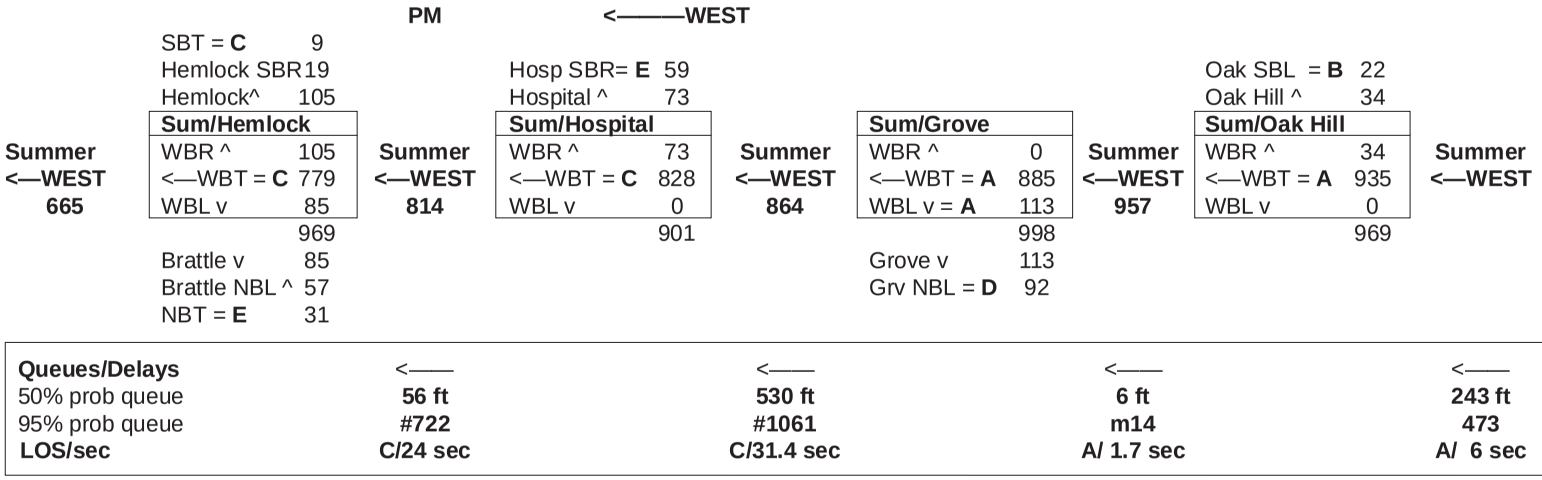


Fig 6.2 Westbound Corridor at peak PM hour

Fig 7 Operation of the Summer Street Corridor Eastbound at the AM peak hour (Project Built, 2009, signals on Summer Street at Mill St, Oak Hill Dr, Grove St, Hospital and Brattle St, Woodside open one-way)

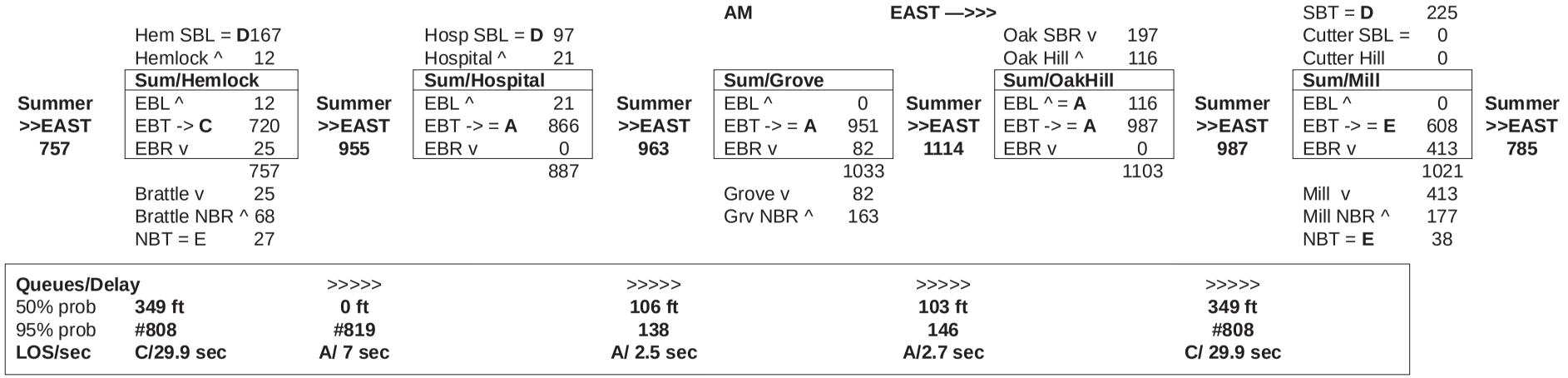


Fig 7.1 Eastbound Corridor at peak AM hour - all signals coordinated EXCEPT Mill/Summer

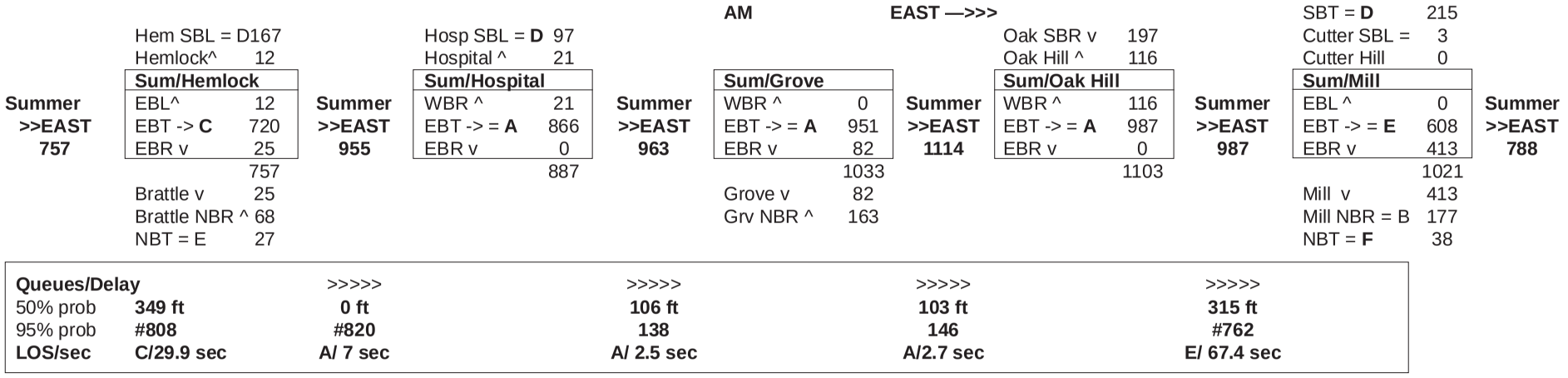


Fig 7.2 Eastbound Corridor at peak AM hour - all signals coordinated INCLUDING Mill/Summer

5.1.4 Consideration of Recommendations

a. Optimization of signal timing at Mill/Cutter Hill Summer Street intersection

HSH proposed optimization of the signal timing of this intersection to improve the operation of Summer Street. All of the analyses conducted have assumed this optimization.

Recommendation A.2 Optimize the signal timing at the Mill/Cutter Hill Summer Street intersection.
We recommend that this optimization be done in the same time frame as the installation of the Hospital Road/Summer Street signal. TAC requests to set the design goals of the optimization.

b. Signal at Grove Street

The intersection at Grove and Summer Streets meets four warrants for the placement of a signal, and has been seriously considered. The difficulties of the intersection without a signal include: a) safety for vehicles turning left from Grove onto Summer, b) the safety of pedestrians, and c) the potential of blockage from the queue at Hospital Road at the PM peak hour.

The difficulties associated with installing a signal here are: a) the road width on Summer Street will not support two left turn lanes (one eastbound at Oak Hill and one westbound at Grove, which are quite heavily used), b) its presence might lead to an increase of cut-through traffic on Oak Hill Drive, and c) the signal may merely push the queues from Grove Street back to the Oak Hill Drive intersection.

A pedestrian signal was discussed, but it must be on a section of roadway rather than an intersection, and such a signal does not meet traffic warrants due to the current low pedestrian volume on this road segment. However, we expect pedestrian volume to increase substantially in the future.

As noted before, a signal was also considered at the Oak Hill Drive intersection that would work in conjunction with Grove, but the 150 ft spacing between the two intersections leads to complex queuing, and again there is insufficient width for two left turn lanes. This configuration was rejected by both FST and HSH, and we agree.

Another option suggested by FST is a set of traffic calming and pedestrian assistance measures to improve safety without a signal. A modification of this suggestion would be traffic islands placed on the eastbound approach to Grove and the westbound approach to Oak Hill. Crosswalks would be installed at the intersection side of each of the islands. In the 150 ft between the intersections, a middle lane would be marked-off that could be used for left turns from either direction. Fig. 8 from FST illustrates this concept.

Recommendation A.3 Adopt a phased approach for the Summer/Grove and Summer/Oak Hill intersections. Phase 1) Traffic calming measures to include refuge islands and crosswalks at Grove and Oak Hill; Phase 2) If needed, signal at Grove Street coordinated with the signals at Summer/Hospital/Brattle.
The signals at Brattle/Hemlock/Summer and Hospital/Summer will likely be installed in the summer of 2006. As Phase 1 for the complex Grove Street and Oak Hill Drive intersections with Summer Street, we recommend implementation of a traffic calming and pedestrian safety design concept as described above, followed by an extensive period of observation of the corridor

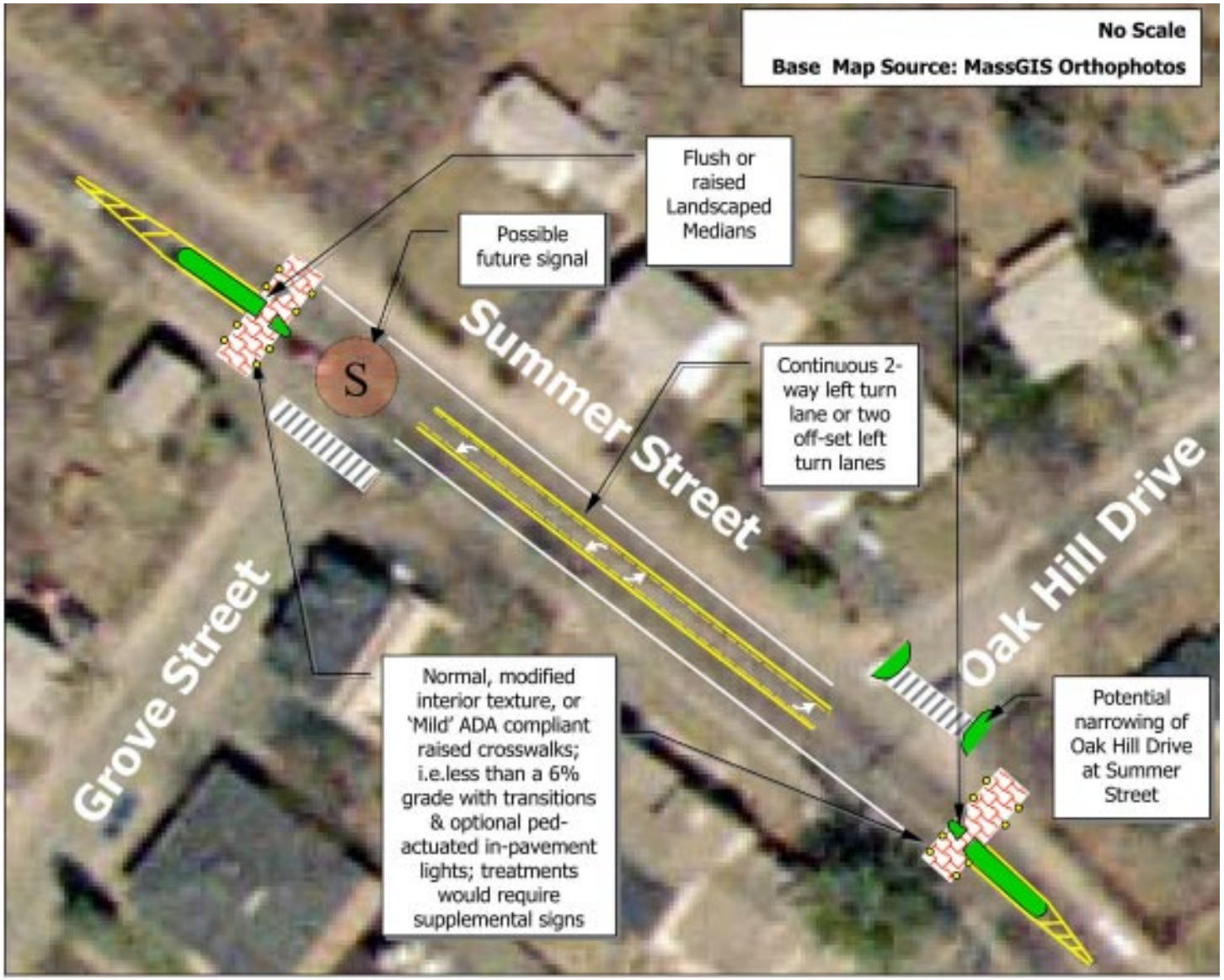


Fig 8. FST Potential Pedestrian Crossing/Calming Concept at Summer Street at Grove Street and Oak Hill Drive

operation after the Hospital Road signal is functional. For Phase 2 we recommend revisiting the Grove Street signal after this observation period, and recommend installing a signal then if it is needed. The capability for coordination between the Hospital Road controller and the potential controller at Grove Street should be provided during sidewalk installation.

b. Right Turn Pocket For Westbound Turn into Hospital Road

Earlier we mentioned that one of the impacts of the signal at Hospital Road was the queues that could block the Grove Street intersection for some of the PM peak hour. A right turn pocket westbound into Hospital Road was examined to see if queue lengths would be significantly reduced. The distance between Hospital Road and Grove Street is 440 ft.

From Fig 5.3 and 5.4, and from additional Synchro data, we construct the table below.

Condition	PM 50%	PM 95%
Fig 5.3; 3.1% volume growth and Woodside open inbound only	440 ft	#966 ft
Fig 5.4; 10% volume growth and Woodside open inbound only	**492 ft**	#1058 ft
10% volume growth and Woodside CLOSED	**630 ft**	#934 ft
10% volume growth, Woodside open inbound only and RT Pocket	356 ft	#934 ft
10% volume growth, Woodside CLOSED and RT Pocket	362 ft	#920 ft

= number is approximate, acceptable for the design of storage bays, and valid for comparisons

Table 2. Impact on Queues of Right Turn Pocket Westbound into Hospital Road

From this data, the right turn pocket does reduce the 50% queue (or the average queue length during the peak hour) to under the 440 feet whether Woodside Lane is open one-way or closed to traffic. Each of the 95% queues (which would be exceeded only 5% of the time during the peak hour) exceed the 440 feet, but these occur for only very short periods.

The presence of this pocket for a distance of 150 to 200 ft would take another 12 foot or so strip from the wooded area and add more asphalt to the Hospital Road intersection. There is also an MBTA Route 67 bus stop in the area of the pocket, causing some additional complications.

Recommendation A.4 Prepare for the possible future installation of a right-turn pocket for westbound traffic turning right from Summer Street to Hospital Road if future studies indicate that it's implementation is of significant benefit.
We recommend that the need for the right turn pocket be reviewed after the Brattle/Hemlock and Hospital Road signals are installed and operating for at least a year, and that this be done in conjunction with the Grove Street signal review. We recommend that the layout of the pocket be designed now, and that the development of the local area where the pocket would be installed be done in a manner that would allow its future installation if needed.

5.2 TASK B: WOODSIDE LANE ACCESS

5.2.1 Background

The current site layout allows vehicular access via two routes: Hospital Road leading to Summer Street, and Hospital Road leading to Woodside Lane. The primary entrance to the site is via Summer Street.

a. Access via Woodside Lane when the Hospital was Fully Operational

A 12-hour traffic count taken when the Hospital was in operation [ref. 3] indicated that most traffic accessed the site via Summer Street. During this 12 hours, approximately 12% of the vehicles used the Woodside lane access.

	12 hour		AM Peak (7:30-8:30)		PM Peak (4:00–5:00)	
	Summer	Woodside	Summer	Woodside	Summer	Woodside
Entering	915	105	169	24	70	6
Exiting	785	134	46	6	159	22
Total	1700	239	215	30	229	28

Table 3 May 11, 1982 Traffic Counts

The actual 24-hour volume with the hospital in full operation should be considerably higher than the 1982 count, for two reasons:

- The 1982 counts were taken before the North wing was added. This wing increased the total floor space by 32%.
- A 24-hour count will have higher volumes than a 12-hour count, especially for a 24/7 operation, such as a hospital.

To extrapolate the 1982 count to a total 24-hour count for the Woodside Lane access, we apply the daily trip generation for the fully operational hospital to the 1982 counts. According to VHB daily trip generation for the fully operational hospital was 4,540 vehicle trips [ref. 4].

239*(4540/(1700+239)) = 560 trips / day via the Woodside lane access[1]

b. Woodside Neighbors Concerns

The Woodside Lane neighbors are concerned that even though the total traffic generated by the site is expected to be less than what was generated when the hospital was in full operation, the changes in land use may mean that a higher fraction of site residents and visitors will use the Woodside access, leading to excessive traffic on Woodside Lane. Reasons that usage of the Woodside access might increase include the following:

- With the change from hospital to mixed residential/medical use, more motorists will be regular users, thus likely to become familiar with the local streets near the site.
- The signal at Hospital and Summer may create significant delay, thus leading motorists to seek alternate routes.

[1]Since this figure is based on a single traffic count and an estimate of total traffic volume when the hospital was in full operation, it should be viewed as approximate.

c. Emergency Services Requirements

The requirements for emergency services (Police and Fire) were discussed at a meeting on February 7, 2005 [appendix F]. These requirements include:

- Two entrances are required to the Symmes site for emergency access.
- The minimum requirement is a one-way access into the site with adequate width for a ladder fire truck.
- The accesses are to have no speed humps or other items that would delay access. (A locked gate will not meet this requirement.)

The Arlington emergency services would also like to have Hospital Road as a public way so that safety regulations could be enforced, but the minimum requirement is that fire lanes be designated and maintained.

d. Symmes Advisory Committee Recommendations

Two recommendations of the Symmes Advisory Committee [ref. 2] are particularly relevant to this discussion:

> *REQUIREMENT: Primary access to the site shall be from Summer Street.*
>
> *REQUIREMENT: Woodside Lane shall remain a low-volume local roadway. No proposal should suggest that more than 10 percent of non-residential peak-hour site traffic would utilize Woodside Lane. Proposals suggesting programs to minimize use of Woodside Lane, including the installation of a traffic monitoring program, are encouraged.*

What does "low-volume local roadway" mean? In those few cases where other jurisdictions have published daily traffic volume guidelines for local roads, they have ranged from a maximum of 1000 vehicles / day (San Antonio, TX) [ref. 5] to 3,000 vehicles / day (Halifax, NS) [ref. 6]. Here in Arlington, although most local roads carry fewer than 1,000 vehicles / day, a substantial number carry between 1,000 and 2,000 vehicles / day, with a few carrying over 2,000 vehicles / day.

5.2.2 Traffic Generation on Woodside Lane

Site-generated Traffic on Woodside Lane Under Various Options

Both HSH [ref. 1] and TAC [appendix G] estimated site-generated traffic on Woodside Lane under several options, as summarized in the table below.

Estimate	Daily Vehicles[1]	Fraction of non-residential peak-hour site traffic using Woodside Lane
HSH Two way access (page 35)	310[2]	5.3% (total, not peak hour)
HSH Two way access worst case (Fig 14)	800	33.2% (total, not peak hour)
HSH Emergency access only	0	0%
TAC Two way access	720	11%
TAC One way access inbound	350	4%

[1] All numbers are rounded to the nearest 10
[2] Calculated as 0.164*1494+0.053*1244 (pages 32 and 35 of HSH report)

Background Traffic on Woodside Lane

Woodside Lane currently serves approximately 70 households. Based on ITE Trip Generation (approximately 9 trips/household/day), we would expect approximately 630 trips / day to be generated by these residents. Not all of these trips will pass a single point on Woodside Lane (for example, someone at the bottom of the hill might use Oak Hill drive, while someone at the top of the hill might travel via Brattle Street, and neither would be included in a count taken at Hospital Road). Therefore, the trips at a particular point on Woodside lane would be somewhat less than the 630 total trips.

5.2.3 Options Considered

Three options were considered:

- Close the Woodside Lane access, except for emergency vehicles, pedestrians and bicycles
- Permit one-way access into the site from Woodside Lane
- Permit two-way access to and from the site via Woodside Lane (the current arrangement)

First, we discuss the advantages and disadvantage of each option. This is followed by a discussion of the impacts of the various options on Oak Hill Drive.

a. Close the Woodside Lane Access

This option has the following advantages:

- Clearly meets the objective of minimizing site generated traffic on Woodside Lane
- Will also reduce possible cut-through traffic from Woodside Lane through the site

However, it has several significant disadvantages:

- It is unclear how unimpeded emergency vehicle access can be maintained (for example, a locked gate requires that all emergency responders have a means of access and may create a delay in the emergency response)
- It is less likely to be properly cleared in winter, thus impeding pedestrian access to the site and its associated bus stop.
- It forces those Woodside Lane residents who wish a safe left turn onto Summer via a signalized intersection onto circuitous routes (either via Millett/Lansdowne/Hemlock or via Cutter Hill).
- It forces site residents and visitors traveling to/from the north onto more circuitous routes
- By forcing all site residents through the Summer/Brattle/Hospital intersection, it will add to the congestion at this intersection.

b. Permit One-way Access into the Site from Woodside Lane

This option has the following advantages:

- It is more consistent than the previous option with unimpeded emergency vehicle access, as a traffic-actuated gate (similar to those in parking lots) can be used if needed for one-way control
- It provides Woodside Lane residents with a reasonably direct, traffic-signal-protected left turn onto Summer Street.
- The 350 site-generated trips on Woodside Lane is considerably less than the 500+ trips via Woodside Lane when the hospital was in full operation
- It is consistent with the SAC requirement to maintain Woodside Lane as a low volume

local roadway (630 background trips plus 350 site trips is fewer than 1000 vehicles/ day)
- It is consistent with the SAC requirement that less than 10% of the non-residential peak hour site traffic use the Woodside Lane access.
- It removes traffic from the westbound approach of Summer Street to the Hospital Road intersection during the evening peak hour.
- It shares some of the impact of the site with residents living on other streets such as Summer.

It has the following disadvantages:
- Enforcement may be a challenge unless a gate is used, although roadway design may help by providing a narrow access. HSH developed a concept to illustrate this [appendix D].
- It can be expected to lead to an increase in traffic on the lower part of Woodside Lane during the evening peak hour.

c. Permit Two-way Access to and from the Site from Woodside Lane

This option has the following advantages:
- It provides unimpeded emergency vehicle access
- It provides Woodside Lane residents with a reasonably direct, traffic signal protected left turn onto Summer Street.
- It provides excellent mobility for residents and visitors to the site who wish to travel to the east or north.
- It reduces peak hour traffic at the Summer Street/Brattle Street/Hospital Road intersections.

It has the following disadvantages:
- Under some estimates, it may not be consistent with the SAC requirement that less than 10% of the non-residential peak hour site traffic use the Woodside Lane access.
- The estimated 700+ site-generated trips on Woodside Lane is greater than the 500+ trips via Woodside Lane when the hospital was in full operation.
- It would likely push daily traffic on Woodside Lane to approximately 1,400 vehicles per day. Although a number of local streets in Arlington do carry daily volumes in excess of 1,400 vehicles (examples include Brooks Street, Cleveland Street, Marathon Street, upper Jason Street, Oak Hill Drive, Orvis Road, and Quincy Street), it is more normal for a local street to carry fewer than 1,000 vehicles per day. It should also be noted that Woodside Lane has steep hills, sharp curves and no sidewalks.

5.2.4 Impacts on Oak Hill Drive

Oak Hill Drive is a local road that carries approximately 1,900 vehicles per day [ref. 1]. Speeding and traffic volumes on this road have been a long-standing concern of residents. Under ***all*** the Woodside Lane access options, it can be expected that some site traffic will use Oak Hill Drive. With respect to additional site-generated traffic, there are four cases to consider:

1. Traffic going from the site to the north

If the Woodside lane access is either closed or one-way inbound, this traffic will likely travel via Hospital Road, Summer Street and Oak Hill Drive, connecting to Route 3 via Ridge Street.

If the Woodside lane access is open in both directions, the traffic will likely travel via Woodside Lane and Oak Hill Drive.

2. Traffic going from the site to the east

If the Woodside lane access is either closed or one-way inbound, most of this traffic will likely use Hospital Road to Summer Street to Mill Street, thus avoiding Oak Hill Drive altogether. However, some motorists may travel via Hospital Road, Summer Street and Oak Hill Drive, connecting to Route 3 via Ridge Street.

If the Woodside lane access is open in both directions, more motorists may find the Woodside Lane/Oak Hill Drive route attractive.

3. Traffic going to the site from the north

If the Woodside lane access is closed, this traffic will likely travel via Oak Hill Drive, Summer Street and Hospital Road.

If the Woodside lane access is open (either two-way or one-way), the traffic will likely travel via Oak Hill Drive and Woodside Lane.

4. Traffic going to the site from the east

If the Woodside lane access is closed this traffic will either use Mill Street/Summer Street/ Hospital Road (avoiding Oak Hill Drive) or will enter the area via Mystic Street/Ridge Street/Oak Hill Drive.

If the Woodside Lane access is open (either two-way or one-way), the Mystic Street/Ridge Street/ Oak Hill Drive/Woodside Lane route may become somewhat more attractive.

Oak Hill Drive Summary

If the Woodside Lane access is closed, more motorists (particularly those traveling to/from the east) will use Summer Street, thus avoiding Oak Hill Drive altogether. However, some motorists (particularly those traveling to/from the north) will use Oak Hill Drive between Ridge Street and Summer Street.

If the Woodside Lane access is open, there will be more turning movements at Woodside Lane and Oak Hill Drive. This may help to reduce speeding on Oak Hill Drive. However, keeping this access open may make the lower part of Oak Hill Drive/Woodside Lane a more attractive alternative to those motorists traveling from the east who would otherwise use Summer Street.

5.2.5 Impacts on Summer Street

Summer Street is an arterial with a mix of residential and commercial land use. Residents there are concerned about

- increased traffic (safety, noise, quality of life)
- character change of the neighborhood (resulting from additional traffic signals and possible roadway width expansion)
- balancing of traffic between the Summer Street and Woodside Lane accesses
- pedestrian safety (walking along the north side of Summer Street, and crossing Summer Street).

Closure of the Woodside Lane access will result in longer queues and more delay at the Summer/ Brattle/Hospital Road intersection (recall Table 2 on page 18). Keeping the access open will reduce delay at this intersection, because some motorists will be able to avoid it.

The impact of one-way access from Woodside is intermediate between that of keeping the access fully open and having it closed. During periods when most traffic is exiting the site (AM peak) its impact will be similar to that of having the access closed. During periods when most traffic is entering the site, its impact will be similar to that of keeping the access fully open.

5.2.6 Recommendation

The committee recommends the following measure:

Recommendation B.1 Permit one-way access into the Symmes site from Woodside Lane.

5.3 TASK C: OFF-SITE ROADWAY MITIGATION

5.3.1 Background

This section summarizes the issues and recommendations associated with off-site roadway mitigation measures for the following locations:

- Oak Hill Drive/Summer Street
- Oak Hill Drive/Woodside Lane
- Oak Hill Drive north of Woodside Lane
- Woodside Lane/Vista Circle/Hazel Terrace

Traffic mitigation issues associated with Summer Street are covered in Section 5.2.

Existing year 2004 peak hour traffic volumes [ref. 1] on the off-site roadways in the study area are as follows:

Oak Hill Drive south of Woodside – 264 vehicles AM/192 vehicles PM
Oak Hill Drive north of Woodside – 236 vehicles AM/163 vehicles PM
Woodside Lane west of Oak Hill – 55 vehicles AM/53 vehicles PM

The intersections of Oak Hill Drive/Summer Street, Oak Hill Drive/Woodside Lane and Woodside Land/Vista Circle/Hazel Terrace are all characterized as wide intersections that have wide corner radii. These characteristics result in long crosswalk distances for pedestrians, high vehicle speeds while turning, and restrict sight distance for some movements. Oak Hill Drive is a relatively straight roadway with a southbound slope linking Summer Street on the south with Ridge Street/Cutter Hill Road on the north. The straight alignment of the roadway is conducive to high vehicle speeds.

Under the one-way and two-way Woodside Lane site access options, the proposed Symmes project would increase traffic volumes on both Woodside Lane and Oak Hill Drive.

5.3.2 Concerns

Residents of both Woodside Lane and Oak Hill Drive areas have expressed concerns regarding safety and speeding vehicles on these roadways. There is a concern that additional traffic generated by the Symmes project will exacerbate conditions on these roadways and intersections.

The Symmes Advisory Committee Recommendations [ref. 2] stated, "REQUIREMENT: Traffic mitigation measures should take into consideration the intersections of Summer Street with Oak Hill Drive, Grove Street…"

5.3.3 Options Considered

The following options were evaluated:

- Narrow the entrance to Oak Hill Drive from Summer Street with curb extensions
- Median separator on Oak Hill Drive approach to Summer Street
- Curb extensions at Oak Hill Drive and Woodside Lane
- Traffic calming device(s) on Oak Hill Drive north of Woodside Lane
- Four-way Stop control at Oak Hill Drive, Woodside Lane and Joyce Road (if Woodside Lane provides two-way access to site)
- Stop sign on Woodside Lane at Oak Hill Drive
- Curb extensions at Woodside lane, Vista Circle and Hazel Terrace

The advantages and disadvantages for each of these options are discussed separately below.

Narrow entrance to Oak Hill Drive at Summer Street

This measure consists of extending the curbs on the Oak Hill Drive corners at Summer Street. The advantages include: reduces pedestrian crossing distance, slows vehicle speeds while turning, improves sight distance, and reduces impermeable pavement area. There are no significant disadvantages, aside from ensuring that drainage and emergency vehicle/truck turning radius issues are addressed during the design process.

Median separator on Oak Hill Drive approach to Summer Street

This measure is an alternative to the curb extension option presented above. This measure has the same advantages as the curb extensions. While the crossing distance for both options would be about the same, this option would provide a median refuge for pedestrians. The main disadvantage of this option is that center median separators at intersections are fixed objects in the roadway and are often struck by vehicles.

Curb extensions at Oak Hill Drive and Woodside Lane

This measure consists of extending the curbs on the Woodside Lane corners at Oak Hill Drive. This measure would have the same advantages and disadvantages as Oak Hill Drove/Summer Street curb extensions listed above.

Traffic calming device(s) on Oak Hill Drive north of Woodside Lane

This measure would consist of installing a traffic calming device(s) on Oak Hill Drive north of Woodside Lane to reduce vehicle speeds. The exact device (vertical or horizontal) would have to

be determined during the design process. The advantages are that a physical traffic calming device would slow vehicles 24 hours every day and improve safety for pedestrians. The disadvantages are that some devices (particularly vertical) may have noise impacts on adjacent residents. Residents would need to be involved during the design process, and there should be a consensus among the affected abutters (over 1/2 approving) for the device(s).

Four-way Stop control at Oak Hill Drive, Woodside Lane and Joyce Road (if Woodside Lane provides two-way access to site)

This measure would provide all-way stop control at each of the four approaches at the Oak Hill Drive/Woodside Lane/Joyce Road intersection. This measure was suggested as a method to reduce vehicle speeds and improve safety. It is an alternative to the traffic calming device discussed above. The disadvantage with this measure is that under existing traffic volumes and one-way Woodside Lane access to the site, traffic volumes would be unbalanced at the intersection. Over time motorists on the Oak Hill Drive approaches would tend to ignore the Stop signs, since there would most often be no competing traffic, and no reason to stop. Because the Woodside Lane access has been recommended for one-way inbound access to the site, this measure provides little advantage for improving safety and reducing vehicle speeds.

Stop sign on Woodside Lane approach to Oak Hill Drive

This measure consists of formalizing the right-of-way for side street motorists by installing a stop sign at the Woodside Lane approach to Oak Hill Drive. This measure would enforce that eastbound motorists on Woodside Lane must stop before proceeding onto Oak Hill Drive or Joyce Road. The existing wide corner radius on the southwest corner of Woodside Lane does not encourage motorists to stop. This measure could be done in coordination with the curb extension measure discussed above.

Curb extensions at Woodside Lane, Vista Circle and Hazel Terrace

This measure consists of extending the curbs on the Vista Circle and Hazel Terrace corners at Woodside Lane. This measure would have the same advantages and disadvantages as the Oak Hill Drive/Summer Street curb extensions listed above. Because both of the side streets are private ways, abutter approval would be needed. This measure could be implemented in coordination with the proposed sidewalk on the west side of Woodside Lane that is discussed in section 5.4.

5.3.4 Recommendations

The committee recommends the following measures:

Recommendation C.1 Narrow the entrance to Oak Hill Drive from Summer Street.

Recommendation C.2 Install curb extensions at Oak Hill Drive and Woodside Lane.

Recommendation C.3 Install traffic calming device(s) on Oak Hill Drive north of Woodside Lane contingent upon abutter consensus.

Recommendation C.4 Install stop sign on Woodside Lane at Oak Hill Drive.

Recommendation C.5 Install curb extensions at Woodside Lane, Vista Circle, Hazel Terrace contingent upon abutter approval.

5.4 TASK D: PEDESTRIANS AND BICYCLES

5.4.1 Background and Process

The Symmes neighborhood presents a complex set of challenges and opportunities for pedestrians and cyclists. Early in the STS's process an inventory was conducted in order to better understand the specifics of the area's conditions. Within a half-mile radius from the main hospital building there are three public schools, four accesses to the Bikeway, four public parks or fields and three distinct bus routes. Destinations and routes were mapped and areas of concern were highlighted. Fig 9 documents this inventory.

Later in the STS's process, the Bicycle and Pedestrian Working Group was formed to discuss problems and potential solutions for the area. The Working Group members were Sandi Bourgeois (pedestrian, Woodside Lane resident), Elisabeth Carr-Jones (Walking in Arlington, TAC member), Deborah Dill (cyclist, Millett Street resident), Jack Johnson (Arlington Bicycle Advisory Committee Chair), Jeff Maxtutis (TAC member) and Stephan Miller (ABAC member, Woodside Lane resident).

The Working Group met to explore bicycle and pedestrian ideas for the Symmes project and surrounding area. After the meeting, the ideas were organized by street and submitted to the Working Group members for prioritization. Four of the Working Group members participated by rating each of the ideas as high, medium or low priority. The result was a prioritized list where the ideas are grouped into three categories under each street:

> Supported by Group = rated high priority by those in the neighborhood,
> Mixed Support by Group = lack of consensus by those in the neighborhood,
> Not Supported by Group = rated low priority by those in the neighborhood.

Within these three categories the ideas were ordered using the priority rankings from those outside the neighborhood. The results of this exercise are recorded in the Pedestrian Working Group Priorities [appendix H].

5.4.2 Site Considerations

Hospital Road and Summer Street

Currently, the Symmes site makes no accommodation for pedestrians. There are no sidewalks on Hospital Road or on the site's Summer Street frontage. Hospital Road also presents difficulties for cyclists due to its steep grades, curves, abutting ledge and embankments.

In 2003, VHB [ref. 4] recommended that all alternatives should consider providing sidewalks on Hospital Road and that bicycle accommodations should be provided within the site. The Symmes Advisory Committee [ref. 2] made the following recommendation:

> *REQUIREMENT: An on-site pedestrian network is required, with connections to public points of access. Sidewalks along the Summer Street frontage are required.*

FST [appendix B] recommended that a sidewalk be provided at minimum on one side of Hospital Road along its entire length, and that a sidewalk be provided on the north side of Summer Street

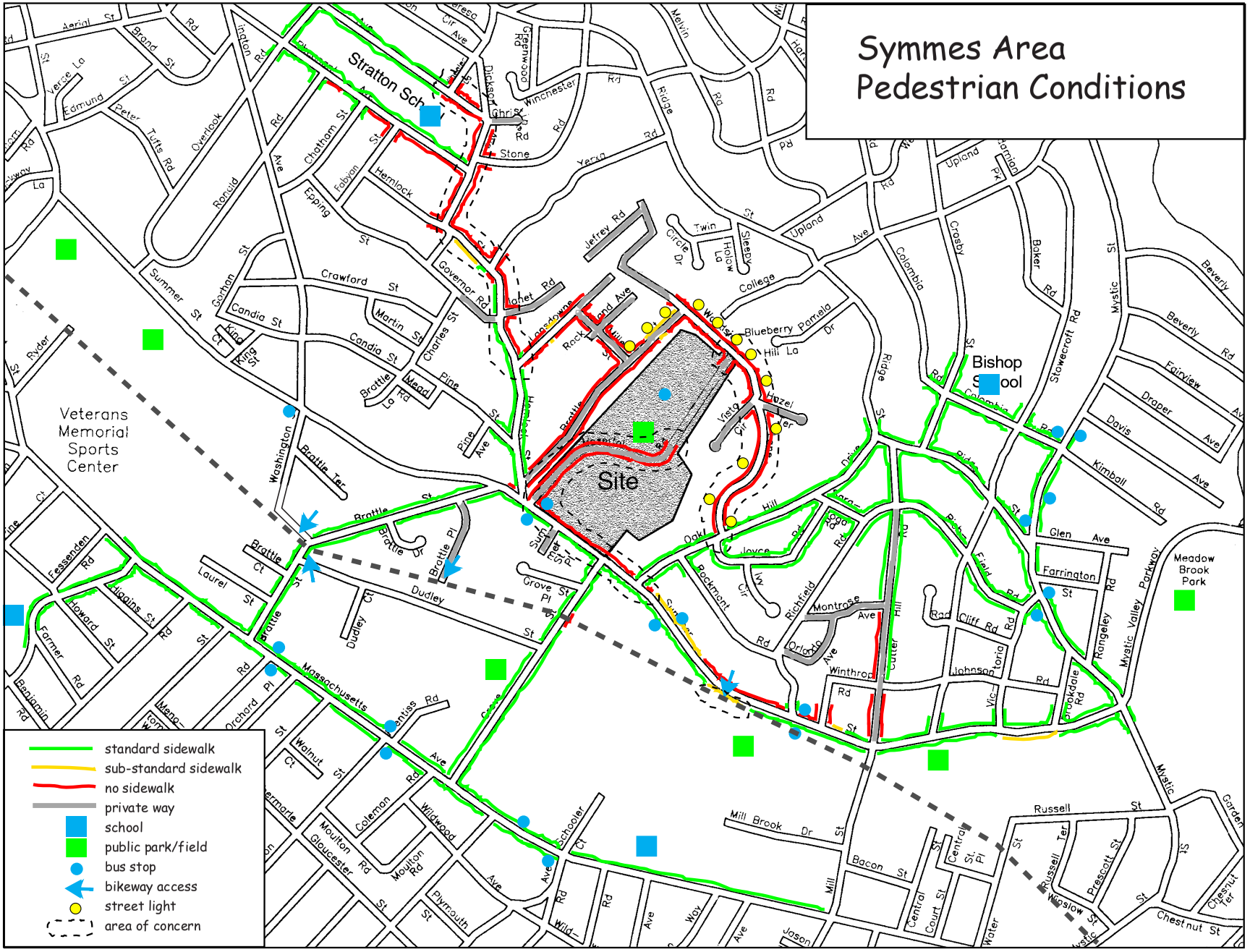


Fig 9 Symmes Area Inventory of Pedestrian and Bicycle Conditions

between the site and the Bikeway crossing of Summer Street. The Bicycle and Pedestrian Working Group ranked the installation of a sidewalk on Hospital Road as a high priority and supported the sidewalk on Summer Street between Hospital Road and Oak Hill Drive. The TAC previously recommended the installation of a sidewalk on Summer Street between Hospital Road and Oak Hill Drive in 2001 [ref. 7] as part of a report on Oak Hill Drive.

Since space for a sidewalk along Hospital Road is restricted by ledge and steep drop offs, a sidewalk on only one side is an acceptable solution. It is understood that the steep grade of portions of the roadway will make the sidewalk ADA non-compliant and that some sections of the sidewalk may be sufficiently steep to require the installation of railings. The Bicycle and Pedestrian Working Group also supported providing a slightly wider sidewalk (6'-7') along the southern portion of Hospital Road in order to accommodate cyclists walking their bikes up the hill.

The section of Summer Street on the north side of Summer Street between Hospital Road and Oak Hill Drive is one of relatively few sections of Arlington's arterial roadways that does not have sidewalks on both sides. It hosts a stop for the MBTA Route 67 bus and a portion of it abuts the Summer Street Woods. Although the installation of the sidewalk and buffer strip would necessitate the loss of some trees in the abutting Summer Street Woods, it could be accomplished sensitively in order to minimize the loss of mature trees. New trees could also be planted within the buffer strip to mitigate this loss.

Sidewalks on Hospital Road and Summer Street necessitate a crosswalk on Hospital Road at the approach to Summer Street to connect the pedestrian network. The combined intersection plan developed by HSH and approved by Mass Highway [appendix E] does not include this crosswalk. Installing the crosswalk was suggested by FST [appendix A] and supported by Bicycle and Pedestrian Working Group.

It is important to note that with the signal phasing presented by HSH to Mass Highway, a Hospital Road crosswalk will be the only crosswalk in the combined intersection that will not have an exclusive pedestrian phase. HSH's proposal for signalling this crosswalk is to have a concurrent pedestrian phase for it during the Summer Street through traffic phase.

The intersection plan submitted by HSH to Mass Highway includes a crosswalk on Summer Street to the west of Hospital Road. Moving the crosswalk to the east of Hospital Road would better service the bus stops on Summer Street and make more sense with the retained crosswalk between Hemlock and Brattle Streets. HSH reports that moving the crosswalk cannot be accomplished using the current signal phasing without a significant decrease in the level of service for eastbound traffic turning left onto Summer from Hospital Road.

Walking Trail

The Symmes Advisory Committee [ref. 2] made the following recommendation.

> *REQUIREMENT: The open spaces of the site are to be established as an interconnected system, maximizing reuse of natural and existing woods and vegetation in a manner that is restored or improved as appropriate to maintain sanctuary for birds and other wildlife. Walking trails shall connect all significant open spaces.*

Although not formally voted, the TAC would like to record its support for the establishment of a walking/hiking trail between the medical office building portion of the site and Summer Street

near the intersection with Grove Street along the old hospital right-of-way. Such a trail would provide a seasonal alternative pedestrian access to the top of the hill as well as a more direct route to and from Massachusetts Avenue via Grove Street.

Site Recommendations

The TAC recommends the following measures:

Recommendation D.1 Install sidewalk on entire length of Hospital Road.
The TAC recommends that the Hospital Road sidewalk provide continuous pedestrian access to the major site destinations, but that decisions on where and if the sidewalk crosses the roadway be made with respect to the site plan in accordance with AASHTO guidelines.

Recommendation D.2 Install sidewalk on the north side of Summer Street from Hospital Road to Oak Hill Drive.
The TAC recommends that the sidewalk and buffer strip be installed in order to minimize the loss of mature trees in the abutting Summer Street Woods, and that new trees be planted where appropriate within the buffer strip.

Recommendation D.3 Add a crosswalk on Hospital Road at the approach to Summer Street.

5.4.3 Off-Site Considerations

The Symmes Advisory Committee [ref. 2] made the following recommendations:

> *REQUIREMENT: Traffic mitigation measures should take into consideration the intersections of Summer Street with Oak Hill Drive, Grove Street, Hospital Road and Brattle Street/Hemlock Street.*
>
> *PREFERENCE: Off-site improvements that provide pedestrian connections to schools and the Minuteman Bikeway are encouraged.*

Summer, Brattle and Hemlock Intersection

There is currently a crosswalk on Summer Street that connects the northwest corner of Hemlock Street and the southeast corner of Brattle Street. Although a new crosswalk is provided across Summer Street west of Hemlock connecting to the turning island for Brattle Street, the intersection plan developed by HSH and approved by Mass Highway [appendix E] does not include this crosswalk. The current crosswalk location is convenient and familiar for area pedestrians and it connects to sidewalks that are cleared of snow in winter. HSH has indicated that retaining this crosswalk will not affect the proposed signal phasing. Retaining the crosswalk in its current location was suggested by FST and supported by Bicycle and Pedestrian Working Group.

The current intersection of Brattle and Hemlock Streets is a hostile environment for pedestrians. Despite the redesign of the intersection, the Bicycle and Pedestrian Working Group was concerned enough about the safety of pedestrians crossing Hemlock Street to recommend that a crosswalk be added at the northwest (uphill) corner of Brattle Street. The Subcommittee considered the crosswalk, but determined that it would be too close to the other crosswalks at the intersection of Hemlock and Summer Streets and that it would add further complication to the intersection.

Woodside Lane

Woodside Lane does not currently have sidewalks. Additional traffic on Woodside Lane would decrease pedestrian safety along this roadway. In association with other recommendations, a sidewalk on the Hospital side of Woodside Lane between Hospital Road and Oak Hill Drive would complete a pedestrian block encompassing Summer Street, Hospital Road, Woodside Lane and Oak Hill Drive. It would also serve pedestrians from the top of the hill using the MBTA Route 350 bus route along Mystic Street. The Bicycle and Pedestrian Working Group ranked this sidewalk a high priority.

However, several obstacles at the periphery of the roadway as well as steep grades in some portions make sidewalk installation challenging for this section of Woodside Lane. If the Woodside access to the site is not closed to traffic, a plan for the sidewalk should be developed for the consideration of the abutters. If there is consensus among the abutters (over 1/2 approving) on the sidewalk plan, then a sidewalk is recommended for this section of Woodside Lane. Additional street lighting on this section of Woodside Lane should also be investigated.

Paper Street at Millett

Preliminary investigation by the Planning Department indicates that the Town is in possession of the paper street lot between the Symmes site and Brattle Street near Millett Street. An informal pedestrian path through the paper street would improve pedestrian circulation between the Symmes site and the neighborhood to the north and west of the site, including the Stratton School.

However, nearby neighbors have expressed concerns regarding any use of the paper street. A title search is required to determine exactly what the Town's legal rights are with respect to this lot. For these reasons, we recommend that decisions regarding the paper street be deferred until the Town's rights to the lot, and an acceptable concept for the informal path, can be determined.

Bikeway Access

Because the Bikeway crosses many of the roadways above grade, there are currently few easy, neighborhood access points to the Bikeway between Arlington Center and Arlington Heights. And there is no north-south access to the Bikeway between Brattle Street and Mill Street. The TAC supports improved access to the Bikeway in this area.

The desirability of an access at Grove Street is evidenced by embankment erosion caused by people scrambling between the Bikeway and the sidewalk at this location. An access stair to the Bikeway at Grove Street would enhance the Town's pedestrian/bicycle network and provide more direct access to the proposed Symmes site pedestrian trail network. The Bicycle and Pedestrian Working Group supported this access stair. Unfortunately, installing an access stair at this location would require significant engineering expense.

The at-grade connector to the Bikeway at Brattle Place has the potential to provide a closer access point to the Symmes site, although the state of the Brattle Place road surface currently discourages cyclists from using it. Roadway repaving to improve cyclist access is a possibility, but it would require the approval of the abutters since Brattle Place is a Private Way. This idea received mixed support by the Bicycle and Pedestrian Working Group.

Currently, the connector to the Bikeway on Summer Street behind the High School is an important access for cyclists in the Symmes neighborhood. However, this connector does not have a curb cut (or ramp) on Summer Street to allow cyclists to ride directly between Summer Street and the Bikeway. The installation of a curb cut at this Bikeway access was suggested and supported by the Bicycle and Pedestrian Working Group.

Stratton School Access

The Director of Planning and Community Development has informed the TAC that the Arlington Schools redistricting plan will place the entire Symmes site within the Stratton School district. Unfortunately, there are currently very few sidewalks between the Stratton School and the Symmes site. The Arlington Transportation Assessment Study [ref. 8] reports that the Stratton School has the highest percentage of roadways within a quarter-mile radius without sidewalks.

Although it is desirable to eventually complete the sidewalk network surrounding the Stratton School, improving the block of Hemlock Street between Yerxa Road and Epping Street on the south/west side of Hemlock Street with a standard sidewalk and buffer strip would be of immediate benefit to Stratton students walking from the site and surrounding neighborhood. It is understood that the steep grade of much of this block will make the sidewalk ADA non-compliant and that some sections of the sidewalk may be sufficiently steep to require the installation of railings.

Off-Site Recommendations

The TAC recommends the following measures:

Recommendation D.4 At the Summer/Brattle/Hemlock intersection, add a crosswalk to the Mass Highway plan from the northwest corner of Hemlock to the southeast corner of Brattle.

Recommendation D.5 Add a sidewalk on the hospital side of Woodside Lane between Hospital Road and Oak Hill Drive, contingent on abutter consensus.

Recommendation D.6 Explore improving access to Bikeway via Brattle Place.

Recommendation D.7 Install a curb cut on the south side of Summer Street behind High School to access Bikeway.

Recommendation D.8 Install and/or improve sidewalks on west side of upper Hemlock Street between Yerxa and Epping for Stratton Elementary School access.

5.5 TASK E: PUBLIC TRANSPORTATION

5.5.1 Background

The closest MBTA bus route to the site is the Route 67, which runs between Alewife Station and Turkey Hill. It currently has an outbound stop at the hospital, while the closest inbound stop is at Summer Street and Hospital Road. It operates between 6:20 AM and 8:30 PM on weekdays only, with a peak hour headway of 25 minutes.

Two other routes within walking distance are the Route 77/Route 79 along Massachusetts Avenue and the Route 350 along Mystic Street. All three routes connect to the Red Line and the Route 350 provides a public transit option for those working near Mall Road or Cambridge Street in Burlington. The closest stops for Routes 77 and 79 are approximately 0.6 miles from the site, while the closest stop for the Route 350 is approximately 0.7 miles from the site. The Route 77 offers service 7 days per week and late in the evening with peak hour headways of less than 10 minutes. The Route 79 offers additional weekday service along Massachusetts Avenue. The Route 350 offers weekday and weekend service with a peak hour headway of 20 minutes.

5.5.2 Options Considered

Options fall into three areas. All are aimed at encouraging transit use.

- Ensure that there is adequate transit service at the site
- Ensure that site residents, site visitors and area residents have attractive walking access to public transit service
- Employ transportation demand management measures to encourage public transit use by site residents and visitors.

Adequate transit service to the site includes, at a minimum, connections between the site and a nearby stop (such as Alewife Station) on the Red Line. This can be provided either through enhanced service on the existing MBTA Route 67 (with both inbound and outbound stops at the site) or via a shuttle between the site and Alewife Station.

Attractive access to transit includes the following elements:

- Transit stops that are near the major trip generators (medical office building and residential areas)
- A sheltered place for passengers to wait
- Safe and direct walking routes between trip generators (both in and near the site) and transit stops, both in the site and in the surrounding area.

Transportation Demand Management (TDM) measures are aimed at reducing single occupant vehicle use and encouraging public transit use. They include:

- Restrictions on parking
- Provision of transit passes as an employee benefit (or, at a minimum, allowing employees to purchase transit passes with pre-tax income)
- Provision of car sharing services
- Carpool and vanpool incentives.

5.5.3 Recommendations

The first two recommendations are aimed at encouraging adequate transit service:

Recommendation E.1 Encourage a shuttle bus operating from site to Alewife Station and town.

Recommendation E.2 Encourage working with MBTA to increase Route 67 service to site and area.
If service on the MBTA Route 67 can be increased, a shuttle bus may not be necessary. However, we recognize that the ability of the MBTA to increase service may be constrained by factors outside of the Town's or the developer's control. Therefore, should it prove impossible for the MBTA to provide adequate service, a shuttle bus should be provided.

The last three recommendations target transit access and transportation demand management.

Recommendation E.3 Provide bus stops with rain cover at site and medical office building.
Major trip generators at the site include the medical office building and the main residential complex. Stops (with shelter) should be provided at both locations.

Recommendation E.4 Encourage tenants of medical office building to employ transportation demand management.
TDM measures, as mentioned earlier, may include pre-tax purchase of transit passes (either as a payroll deduction or as a fringe benefit), publicity to encourage car pooling, preferential parking for car pools, provision of bicycle parking and charging for single occupant vehicle employee parking.

Recommendation E.5 Encourage unbundling the cost of parking in all leases and purchases.
This recommendation applies to both the residential area and the medical office building. To discourage residents from bringing an excessive number of vehicles onto the site, the cost of parking should be unbundled from leases and sales. This means, for example, that a sale of an apartment might include a single parking space, with a discount offered to the buyer who is willing to forgo that space, and a per-space surcharge imposed on the buyer who needs two or more spaces.

References

1. *Symmes Hospital Redevelopment Transportation Overview*, Howard/Stein-Hudson, September 13, 2004.

2. *Recommendations to Special Town Meeting*, Town of Arlington Symmes Advisory Committee, May 5, 2003.

3. *Traffic Study*, Choate-Symmes Health Services Inc, Arthur Leslie, VP for General Services to President Paul Downey, May 12, 1982.

4. *Symmes Hospital Reuse Alternatives Draft Transportation Alternatives*, Vanasse Hangen Brustlin, January 8, 2003.

5. *Rule Interpretation Decision: Clarification of Street Classification by Traffic Counts*, San Antonio, Texas (www.sanantonio.gov/dsd/pdf/RID_014.pdf).

6. *Shortcut Policy*, Halifax Regional Municipality web site (http://www.halifax.ca/traffic/calming/Shortcut_Policy).

7. *Consideration of Oak Hill Drive Referral*, Town of Arlington Transportation Advisory Committee, November 14, 2001.

8. *Transportation Assessment Study*, Town of Arlington, Massachusetts, The Louis Berger Group, May 2002.

Appendix

A. FST Peer Review

B. FST Update Peer Review

C. HSH Right Turn Pocket Memo

D. HSH Woodside Access One-way Concept

E. HSH Summer Street Traffic Signal Plan

F. APD/AFD Emergency Services Requirements

G. TAC Draft Traffic Volume Analysis

H. TAC Bicycle and Pedestrian Working Group Priorities

I. TAC Symmes Trip Generation Comparison

J. TAC Symmes Trip Distribution Comparison

FAY, SPOFFORD & THORNDIKE, LLC
Engineers • Planners • Scientists • Landscape Architects • Surveyors

15 Broad Street, Suite 301
Boston, MA 02109
Toll Free 800.835.8666
Tel 617.723.8882
Fax 617.723.9995
www.fstinc.com

September 15, 2004

Mr. Edward Starr, Chairman
Town of Arlington Transportation Advisory Committee
Arlington Redevelopment Board
730 Massachusetts Ave.
Arlington, MA 02476

Subject: Peer Review– Symmes Redevelopment Plan Traffic Impact Study and Mitigation Plan

Dear Mr. Starr:

Fay, Spofford & Thorndike (FST) is pleased to submit this peer review letter to assist the Town of Arlington in evaluating the traffic impacts of the Symmes Redevelopment Project. It is our understanding that the development includes, at full buildout, 255-265 condominium units and a 40,000 square foot medical office building on the existing 18-acre former Symmes Hospital site that is currently accessed via Hospital Road and Woodside Lane.

A senior staff person from FST attended a neighborhood meeting organized by the TAC on September 8, 2004. He also visited the project site and all potentially affected streets/intersections to gain a better understanding of the real and perceived traffic and safety issues. Specifically, this letter addresses the:

- *Symmes Hospital Redevelopment – Transportation Overview* (Howard/Stein-Hudson Associates, Inc., September 2004) – referred to from here on as 'the HSH Study.' HSH also provided:
  - Electronic copies of Build traffic analysis conducted with and without the use of Woodside Lane;
  - An electronic copy of a proposed modifications to the traffic signal plan at the intersection of Summer Street with Brattle Street, soon be reconstructed as part of the Summer Street Improvement Project;
  - An electronic copy of the proposed mitigation plan and its conformance to the recommendations of the Symmes Advisory Committee; and
  - An electronic copy of graphics showing the travel time routes studied.

This peer review was also performed within the following context:

- *Article 8, Town of Arlington* Off Street Parking and Loading Regulations;
- *Town of Arlington Symmes Advisory Committee – Recommendations to Special Town Meeting,* May 5, 2003; and

- *Symmes Hospital – Preliminary Transportation Findings*, VHB, Inc. August 21, 2002.

Executive Summary

It is concluded that the potential site traffic impacts have been adequately and conservatively estimated in the HSH Study. As far as traffic mitigation goes, the Proponent has indicated it is committed to fulfilling the requirements of the Symmes Advisory Committee. While there is room for modifying the mitigation commitments to address neighborhood -- see discussion further on -- by and large, the commitments proposed are reasonable and workable.

Task 1 - Transportation Overview Study

1.1. *Collected Traffic Data:* evaluate the appropriateness of counts with respect to day and time, location, seasonality differences, etc.

Counts were performed in accordance with typical traffic data collection procedures. Traffic data was collected on Tuesdays to Thursdays, typical weekdays for performing traffic counts. Specifically, the data collection dates were March 4, as well as Tuesday and Wednesday May 25 and May 26, 2004. Schools were in session when the counts were performed. According to MassHighway seasonal traffic volume correction factors, traffic volumes recorded during the month of March are 2% higher than average annual traffic, and May volumes are nearly 9% higher than average annual traffic volumes for the types of roadways counted.

As the HSH study did not lower the volumes counted, the 'base case' count data used is conservative, or on the high side. The study area involved 10 intersections and 10 automatic traffic recorder count locations. We believe the study area is large enough to address the traffic impacts anticipated from the site.

1.2. *Crash Histories:* determine if there are any patterns or trends that may be correctable.

FST checked the crash data summary presented in the HSH Study against our own files of MassHighway data. The HSH study indicates, and we concur, that none of the intersections where traffic data was collected have historical crash rates that exceed statewide rates for unsignalized intersections. A review of crash rates indicates that the narrow private streets and closely spaced homes in the area are effective 'traffic calming' measures in and of themselves. However, the measured and observed speeding on Oak Hill Drive, posted at 25 mph and driven at speeds well in excess of 30 mph is a problem. Oak Hill Drive is wider than most of the north/south local streets in the area and serves as a shortcut between Summer and Ridge Streets. Narrowing of Oak Hill Drive and/or 'silent policemen' variable message signs (see below) might be considered. Speeding was also observed on Summer Street, also posted at 25 miles per hour in the study area.

Field observations, consistent with the HSH study traffic operations analyses, indicate that during peak hours motorists can become frustrated making left turns from the unsignalized cross streets of Oak Hill Drive and Grove Street. Limited sight distances at some of the intersections (e.g., Grove Street at Summer Street) in the area should be addressed. Keeping

potential safety enhancements environmentally-friendly will be challenging. In such constrained areas, regular trimming of hedges or vegetation may be a solution. More costly solutions include relocating utility poles or converting to underground utilities at corners where sight lines are problematic.

The proposed Summer Street modifications west of the Symmes development site including the intersection of Summer Street with Brattle Street and Hospital Road are expected to improve both operations and safety.

1.3. Existing Capacity of Intersections: evaluate how well the Level of Service results replicate current conditions, and if the geometric, signal timing, and capacity adjustments are reasonable.

The existing conditions FST observed during the PM peak period appear to be reasonably consistent with the analysis results summarizing existing condition operations. For example, left turns from unsignalized intersections approaching Summer Street were difficult to make during peak hours (e.g., Grove Street approaching Summer Street and Massachusetts Avenue, and Oak Hill Street approaching Summer Street).

A review of the capacity adjustments indicate they are reasonable to consider for mitigation.

1.4. *Trip Generation Calculations*: evaluate the completeness of the results, including any deductions for mode split, etc.

Trip generation calculations summarized in the report and contained in the Technical Appendix were conducted using the ITE Trip Generation 7th Edition, the industry standard for calculating vehicle trip generation. According to the VHB report on traffic impacts of site development options, the option evaluated generates approximately 70% as many trips as the lowest generating of the options.

An independent check of the trip generation calculations indicates they were performed correctly.

We note the HSH analysis was for 275 dwelling units, while the report references 250-265 units. The use of a higher-than-expected number of units makes the base trip generation calculation conservative. Additionally, the HSH Study assumed the average trip generation rates rather than the fitted curve trip generation results. This makes the trip generation figures analyzed more conservative as, in this particular case, the average rate calculation is higher than the fitted curve calculation.

The most conservative approach to trip generation would have been to use the ITE rates directly without any adjustments. Nonetheless, reasonable adjustments (lowering of trip rates) were made for some transit and bike/walk mode use based on a combination of the 1990 and 2000 Journey to work census data information. ITE recommends use of local data to adjust its trip generation rates -- this is an example of a local adjustment. The HSH study that assumed 6-10% non-auto modes from the 2000 census data for the census block in which the Symmes

development site is located. This assumption, given the existing transit service in the area is not unreasonable. Because the MBTA 67 bus route only provides outbound service to the site, the HSH study mitigation section indicates that the Proponent will 'work with the MBTA to modify its existing services to the site'. A commitment to work with the MBTA may not be enough to encourage strong transit use to and from the Symmes site and we recommend this commitment be strengthened.

1.5. *Trip Distribution and Assignment of Trips*: evaluate the assumptions based on US Census Journey-to-Work data and the assignment of trips to roadways and determine if they are reasonable. Assess if appropriate time surveys have been conducted and if their results are reasonable.

Two distribution patterns were assumed; one with access to Woodside Lane and the other without access to Woodside Lane. Within the context of the regional highway system and the available route choices, we conclude the assignments for both options were done reasonably and tend to reflect the distribution patterns of traffic on other streets in the area. However, we conclude some trips should be assigned to Grove Street under Option 1 and Woodside Lane under Option 2 (see attached presentation concerning peer review).

Because the analysis only 'netted out' existing vehicle trips at the Hospital Road intersection with Summer Street, the analysis is conservative at all the other off-site intersections evaluated, as existing trips are double-counted at the other off-site locations.

1.6. *Background Traffic*: evaluate the assumed level of future traffic growth and determine if it is reasonable for both regional growth and local development.

Background traffic was assumed at 0.5% per year, even though historical traffic count data indicates volumes have been declining in recent years. We believe the 0.5% per year is a reasonable estimate of background traffic growth for a fairly stable community like Arlington and consistent with future traffic growth estimates made by the Central Transportation Planning Staff. The historical traffic volume data from 2000-2004 indicates that Summer Street traffic has declined since the year 2000. Traffic volumes within MassHighway District 4, where Arlington is located, generally declined by 2% during 2003.

At a recent meeting with neighbors, it was indicated that a new park will be opening to the west via Summer Street and 20 residential units have been approved for construction. These two developments, while not specifically called out in the study, are not expected to bring background traffic growth beyond the 2.5% assumed in the HSH study over the next 5 years.

1.7. *Future Capacity Analysis of intersections*: evaluate the results and determine if they are reasonable.

The analyses conducted were found to be reasonable for the two optional choices for site access -- Option 1 - retain the Hospital Road and Woodside Lane accesses, or Option 2 - provide only one vehicle access point to and from Hospital Road.

As noted in the attached presentation, the analyses of Grove Street at Summer Street and Massachusetts Avenue and Summer Street at Oak Hill Drive and Cutter Hill Road, could be modified slightly to reflect a slightly different trip assignment than assumed for Grove Street under Options 1 and 2 and Oak Hill Drive under Option 2.

1.8. Pedestrian, Bicycle and Transit: evaluate if the study has adequately considered the pedestrian, bicycle and transit access and circulation.

While the HSH study addresses pedestrian, bicycle, and transit access and circulation, other measures should be taken to ensure the site will adequately address reductions in vehicle traffic. These measures include:

- At the combined intersections of Hospital/Summer/Brattle:
  - Provision of a sidewalk on the entire north side of Summer Street between Brattle and Oak Hill Drive.
  - Provision of an additional cross-walk on the Hospital Road approach to Summer Street (access to MinuteMan Bikeway).
- Provision of a cross-walk from the northwest corner of Brattle Street to the southeast corner of Brattle Street with additional pedestrian signal heads with pushbuttons and a new pedestrian ramp on the corner.

1.9. Mitigations: evaluate the proposed mitigations and determine if they are appropriate to improve deficient conditions, both existing and future conditions caused by the project, and if any additional mitigations are necessary. Re-analyze selected intersections to see if there is a discrepancy. Evaluate the adequacy of data and analysis to determine the reasonableness of the mitigations.

The HSH study indicates either of the two access strategies -- i.e., with and without the Woodside Lane access -- are acceptable to the Proponent. The SAC indicates that no more than 10% of the trips from the site should be using the Woodside Lane access. An examination of the Woodside Lane historical crash data indicates approximately 1 reported crash per year on it. Due to its small volume of 250-580 vehicles per day (the HSH study indicates approximately 252 vehicles per day, while the TAC in an August 2003 report indicates there were 584 vehicles per day. Both studies could have been right, as the volumes were conducted at different locations along Woodside Lane, with the higher volume count at a point where more homes were served than the lower volume count.

While keeping Woodside Lane open to traffic, is a workable option, the poor sight line to the west of the hospital and absence of sidewalks and its steep downgrade does make outbound and inbound traffic problematic. The proposal to allow only inbound traffic from Woodside Lane appears to be difficult to implement. We prefer the Option 2 strategy with the existing

Woodside Lane corridor retained in its current configuration. Woodside Lane should remain available for emergency access and pedestrian/bicycle access to Hospital Road.

Grove Street at its intersection with Summer Street and Massachusetts Avenue likely meet signal warrants today. However, given the spacing between Grove Street and the Brattle/Hospital Road signal, it may be most appropriate to consider sight line improvements and possibly a pedestrian-only activated signal at Grove Street, if it meets warrants for signalization.

The Proponent's proposed sidewalk improvements on the north side Summer Street should be extended to the intersection of Oak Hill Drive, at minimum. Hospital Road should have a sidewalk at least on the east side.

We recommend a free shuttle service be provided between site and the Alewife T Station to reduce vehicle trip making. The service should have at least three stops on Hospital Road -- on both sides of its intersection with Summer Street, in the vicinity of the Medical Office Building and at the top of the hill toward Woodside Lane with minimum 15 minute service during the AM and PM peak periods. Route 67 provides off-peak service.

We do not find any significant problems with the traffic analyses performed. The results of both access options are reasonable, but should be tweaked to reflect the minor change in trip assignments illustrated on the attached display. In either access scenario, the Grove Street and Oak Hill Drive approaches with Summer Street remain congested during peak hours. Both Options 1 and 2 increase peak period queues on Summer Street compared to the No-Build alternative, but queuing in both cases is manageable, as the intersection levels of service at the signalized intersection of Summer Street at Brattle Street/Hospital Road are expected to be acceptable, lower than capacity, during peak periods.

Warrants for a possible pedestrian signal at the Grove Street intersection with Summer Street should be evaluated during the Special Permit phase. This may be the first step in advance of full signalization at this location, if signal warrants are met. Such a signal would enhance pedestrian access between the site and Arlington High School and minimize disruption to traffic on the Summer Street corridor. Its timing should be coordinated with the Brattle/Summer (Hospital Road) and Cutter Hill Road/Summer signals. This could be the first step in potential full signalization of this intersection.

Traffic calming measures should be provided on the Oak Hill Drive corridor to reduce speeding. Such measures should be committed to in concert with neighbors during the Special Permit Review process.

The details of other potential sidewalk enhancements that may be directly related to pedestrian travel patterns developed by this site (i.e., travel patterns to nearby schools) should be provided during the Special Permit review process.

Please feel free to contact me and refer to the attached presentation for illustrations of the peer review process, findings, and recommendations. FST sincerely appreciates the opportunity to provide these services on behalf of the TAC.

Very truly yours,

FAY, SPOFFORD & THORNDIKE

By

Gary L. Hebert, P.E., PTOE
Vice President

PA-915
GLH:gh
Attachment::Peer Review Presentation 9/14/04

FAY, SPOFFORD & THORNDIKE, LLC
Engineers • Planners • Scientists • Landscape Architects • Surveyors

15 Broad Street, Suite 301
Boston, MA 02109
Toll Free 800.835.8666
Tel 617.723.8882
Fax 617.723.9995
www.fstinc.com

February 17, 2005

Mr. Edward Starr
Town of Arlington Transportation Advisory Committee
c/o Mr. Joseph F. Tulimieri
Cambridge Redevelopment Authority
One Cambridge Center
Cambridge, MA 02360

Subject: Status Report - Arlington, MA – Symmes Update Peer Review and Arlington TAC Technical Assistance

Dear Ed:

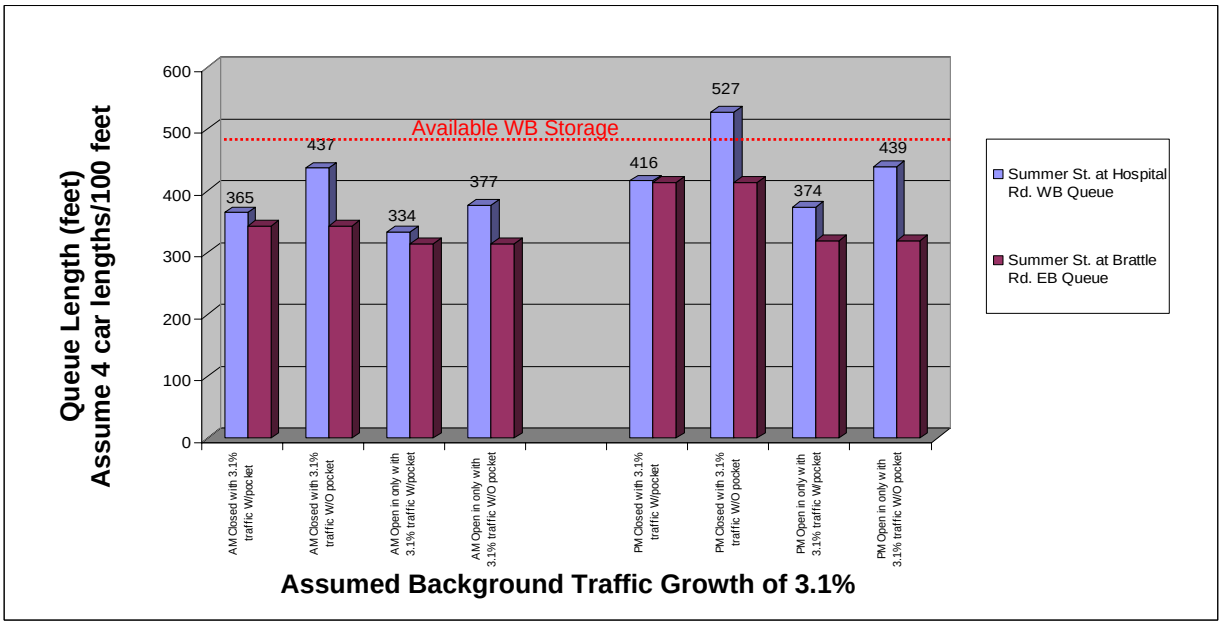
Per our Agreement, this letter is being submitted to address the supplemental Technical Assistance to the TAC in evaluating the Symmes Special Permit traffic mitigation measures.

Task 1 Review the Howard/Stein-Hudson Associates (H/SH) traffic analysis of queuing on Summer Street. Determine whether Grove Street and Oak Hill Drive should be signalized. If so, how and when should this occur?

TAC's request for sensitivity analysis of Summer Street queuing leads us to conclude the following:

Issue 1 - The proposed 200-foot long right turn pocket on the north side of Summer Street approaching Hospital Road:

- The proposed turn pocket has environmental issues (removal of a couple of trees and green space) that may offset its traffic benefits.
- With the assumed Summer Street background growth totaling 3.1% to the design year, it is concluded that the addition of the right turn pocket lane typically reduces the AM and PM peak hour queues on Summer Street by approximately 2-4 car lengths depending on whether Woodside Lane is open or closed.
- With an assumed Summer Street background growth totaling 10% to the design year (also refer to the chart on the next page, it is concluded that the addition of the right turn pocket lane typically reduces the AM and PM peak hour traffic queues on Summer Street by approximately 3-5 car lengths. (refer to charts on the page that follows).



Based on the historical Summer Street traffic volumes, it is not unreasonable to assume that Summer Street may at some point carry traffic volumes similar to those it carried several years ago. Even with a 10% assumed growth in traffic on Summer Street, its traffic can grow approximately another 15-20% during peak hours in the peak flow direction before the corridor becomes saturated.

Conclusion: The right turn pocket is beneficial from a traffic perspective, as it reduces queues toward Grove Street. The question is the trade-off between the green space lost vs. the reduced traffic queues. This is a community value issue. Similarly, with Woodside Lane open one-way to Symmes inbound traffic, the difference in queuing with the right turn pocket is approximately 1-2 car lengths. With Woodside Lane closed to all Symmes traffic, the difference in queuing is 2-3 car lengths without the turn pocket.

Issue 2 – Should Grove Street and Oak Hill Drive be signalized? If so, when?

According to the H/SH studies, the Grove Street intersection already meets signal warrants. A review of the analysis indicates that in order to install an effective traffic signal at this location, a relatively short westbound left turn lane needs to be incorporated on Summer Street into the signal design. Additionally, the Summer Street eastbound approach to Oak Hill Drive has a significant amount of left turns that will block through movements without a short eastbound left only lane on Summer Street. With only approximately 150 feet separating the intersections from stop bar to stop bar, the short left lanes will indeed be very short – i.e., each 50 feet long with a 50 foot transition or, alternatively, a 150 foot long two-way left turn lane. The nice thing about the way the road operates today is that its cross-section is wide enough at 38 feet to allow left turning vehicles to take full advantage of the 150-foot separation and there is still room for most through traffic, except for wider trucks, to bypass on the right.

As the TAC is aware, a traffic signal is usually installed as a last resort, if other measures are not effective. Ostensibly, the benefits of new signal control at either Grove Street or Oak Hill Drive are:

1) It would improve safety for pedestrians crossing Summer Street;
2) It would provide a better opportunity particularly for left turning motorists to exit either Grove Street or Oak Hill Drive (in aggregate from 75-100 vehicles during the AM or PM peak hours) and left turning motorists from Summer Street to cross opposing traffic entering and exiting Grove Street and vice versa for Oak Hill Drive motorists in a similar manner.

However, three primary unintended consequences associated with signalization are:

1) Rear end crashes may increase;
2) Trip diversions may increase (people trying to avoid signals or people trying to take advantage of the signal to increase use of the Oak Hill Drive/Grove Street corridor)

3) Queuing on Summer Street may increase its overall delays, even though the offset intersection will operate a projected LOS A-B.

Perhaps the most critical traffic signal warrant for determining whether Grove Street should have a traffic signal installed sooner rather than later is the crash warrant. While 'reported' crashes do not include all crashes, during the past few years (2001-2003), there were six reported crashes at the intersection of Grove Street with Summer Street and four reported crashes at the intersection of Oak Hill Drive with Summer Street, there were an average of between 3 and 4 crashes annually at the combined intersections. It is noted that a recent Townwide study found that there were, on average, approximately 3 crashes per year at the intersection of Grove Street with Summer Street between 1990 and 2000. Typically, the crash warrant is met when there are 5 or more crashes per year *susceptible to correction through signalization*, so neither intersection meets the crash warrant. Some of the reported crashes were rear-ends, which typically increase following signalization.

Additionally, the Oak Hill Drive intersection with Summer Street clearly does not meet warrants for signalization. Its measured vehicle and pedestrian volumes are too low. However, the intersection had four reported crashes in 2003. This trend needs to be monitored. No crashes were reported at this intersection in 2002 or 2001.

Conclusion: While a signal could be installed at the Grove Street intersection at this time, it is **not** recommended as a high priority due to the unintended consequences cited above. After examining at the traffic patterns, the dynamics of the Oak Hill Drive/Grove Street traffic pattern leads FST to conclude that if signalization occurs only at Grove Street (which probably makes the most since rather than creating an offset signalized intersection with Oak Hill Drive), care must be taken to provide left turn lanes, as discussed above, on both Summer Street approaches to Grove Street and Oak Hill Drive to keep left turning motorists heading to either of the offset intersections from completely blocking the Summer Street eastbound/westbound through traffic.

Task 2 Evaluate the local street designation capacity of Woodside Lane and its projected volumes with and without the one-way inbound access proposal

As discussed at my recent meeting with Ed Starr, the *actual vehicle-carrying capacity* of Woodside Lane is not an appropriate measure of the acceptability of additional traffic to Woodside Lane. At issue is what is the 'functional capacity' of Woodside Lane. By 'functional capacity' what is meant is that Woodside Lane has a 'local' street functional classification. By American Association of State Highway and

Transportation Officials (AASHTO) A Policy on Geometric Design of Streets and Highways (as amended, 2004) a local road is expected to carry less than 25% through traffic. In this case, based on information supplied by the Town of Arlington, there are approximately 75 homes served by Woodside Lane. Refer to the summary below for comparisons of relevant information.

	AM Peak Hour			PM Peak Hour			Average Weekday
Woodside Lane Computations	AM Trips in	AM Trips out	AM Total	PM Trips in	PM Trips 0ut	PM Total	Daily Trips
ITE Trip Generation Estimates*	15	46	62	53	30	83	796
Local Functional Capacity**	19	58	77	66	37	104	994
2004 AM/PM (H/S-H Counts)	20	36	56	29	24	53	600
Local Functional Capacity**	25	45	70	36	30	66	749

Pre-closure Symmes Woodside Lane Volumes	
30	7:00-8:00 AM peak hour
40	4:30-5:30 PM peak hour
239	12-hour measured 6 AM - 6 PM (peak 12 hours)
385	24-hour estimate (FST)

* Assumes 75 Homes

** Local Functional capacity is ITE or counted volume times 1.25.

If one assumes the ITE *Trip Generation* report (2003, as amended) rates apply to the existing approximately 75 homes served by Woodside Lane, the following can be concluded:

- Applying the ITE formula methodology for single family homes along Woodside Lane, it leads one to conclude that a maximum daily flow on Woodside Lane, assuming up to 25% through traffic, would be 982 vehicles per day and 77-102 vehicle trips during peak hours. Given the fluctuation in daily volumes, this would suggest a maximum acceptable volume on Woodside Lane of approximately 1,000 vehicles per day or 100 vehicles per hour during the peak hours at its intersection with Oak Hill Drive. We note that this is well below the street's actual vehicle carrying capacity, but, in our opinion, is a more practical way of looking at the issue of 'How much traffic should Woodside Lane have?'

- Applying the actual 2004 H/SH counts taken during peak hours at the intersection of Woodside Lane at Oak Hill Drive ***would not be appropriate***. The actual volume counted was 33% lower than the ITE rates would suggest might be generated along Woodside Lane if all the traffic were to use it. However, because it was a one-day count and some

Woodside Lane abutters have the option to use Brattle Street or Hospital Drive, the difference is reasonable.

- The Symmes Committee commitment that "***No more than 10% of the non-residential peak hour site traffic shall utilize Woodside Lane.***" Taken at face value, 10% of the non-residential component of the Symmes redevelopment plan would entail 9-13 vehicle trips per hour. However, the identification of the non-residential traffic coming from Symmes would be difficult, if not impossible to achieve. H/SH estimates the residential component of the Symmes redevelopment plan will generate 113-133 vehicle trips per hour. It is doubtful that the Committee assumed it would be ok for the entire residential component to use Woodside Lane. If what was actually meant was 10% of the entire Symmes redevelopment traffic (including its residential component), than the acceptable added impact of Woodside Lane would be 20-26 vehicle trips.

- As a comparison, during traffic count conducted in 1982, Symmes Hospital added approximately 385 vehicle trips per day to the Woodside Lane. During peak hours, the count indicated that 30 vehicle trips occurred during the AM peak hour and 40 vehicle trips during the PM peak hour.

As far as the geometric features of Woodside lane are concerned, the elevation difference between Oak Hill Drive and Hospital Drive is approximately 112 feet. For an approximate 1,200 linear-foot centerline distance, this represents an average grade of 9.3%, with peak grades being nearly 14%. Similarly, at Hospital Road from the crest to Summer Street the elevation difference is approximately 125 feet for an approximately 1,350 linear centerline distance, which also represents an average grade of 9.3% with peak grades also approximately 14%. The design speeds of both Woodside Lane and Hospital Road vary by location. Woodside Lane has more curves than Hospital Road, with the tightest one having approximately a 75-foot centerline radius (just over 15 miles per hour) Hospital Road has approximately a minimum 110-foot centerline radius at its sharpest corner (under 19 miles per hour). Neither road has a typical 30 miles per hour design speed. The big difference between the two roadways will be that Hospital Road is being improved with sidewalks, lighting, etc. There will be a total of 5 curb cuts on Hospital Road, while Woodside Lane has no sidewalks and a total of 23 curb cuts including 21 driveways and two cul-de-sacs between Hospital Road and Oak Hill Drive. The sight distance at the Hospital Road intersection with Woodside Lane is constricted vegetation and by a vertical crest.

From the photos below, it is evident that winter/summer conditions along Woodside Lane differ significantly. On one hand Woodside Lane vegetation sight distance deficiencies (see

left) are reduced during the winter months. However, sight lines at driveways diminish during heavy snow conditions such as those encountered recently.

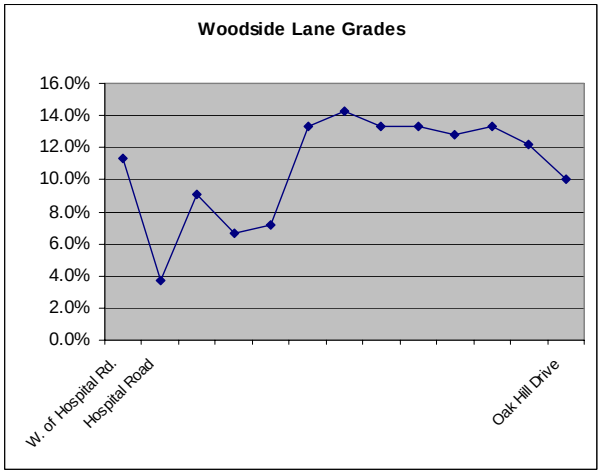
Hospital Road looking west to Woodside Lane

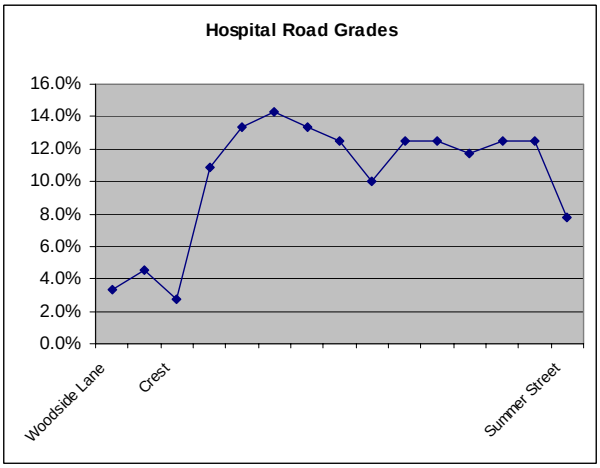
Conclusion: During our initial review, FST recommended that Woodside Lane provide emergency, pedestrian, and bicycle access. We see no reason to change this recommendation in light of its constricted geometric and sight line conditions and its functional capacity. We note that emergency access means that there must not be a locked gate, according to recent Arlington Deputy Fire Chief discussions with the TAC.

Potentially, ***restricting inbound access to less than 40 vehicles per hour during peak hours*** from Woodside Lane is a reasonable option that can be considered for testing if monitoring equipment is installed at the Woodside Lane entrance and the findings are regularly made available to Woodside Lane neighbors.

Woodside Lane looking east at Hospital Road

Further west – similar winter view





Task 3 Explore pedestrian connections mitigation (to neighborhood schools) the potential for a 3-way stop control at the intersection of Oak Hill Drive and Woodside Lane

Elizabeth Carr-Jones provided a map indicating the current sidewalk conditions in the Symmes area. With the exception of a few locations where short lengths of substandard sidewalks exist, there are no sidewalks between the Symmes redevelopment site and the Stratton School via Woodside Lane, Millet Street, and Lansdowne Street to Hemlock and Dickson Avenue. As mentioned above, there are also no sidewalks on Woodside Lane between the site and Oak Hill Drive.

As part of a mitigation strategy, the Proponent should provide a shared sidewalk/bikepath into the site from Woodside Lane. A sidewalk should be provided at minimum on one side of Hospital Drive along its entire length, probably the east side is most appropriate given the location of the high school and Town Center. If technically feasible, it would be preferable to have sidewalks on both sides of Hospital Road. It is important to understand that these sidewalks will not meet ADA minimum grade requirements due to the natural steep grades in the area and may require railings in areas where grades are steeper than 8.6% -- virtually the entire length. A sidewalk should also be provided on the north side of Summer Street between the site and the bikeway crossing of Summer Street. The bikeway crossing of Summer Street should also be addressed with a special pedestrian crossing treatment. The substandard sidewalk on the north side of Summer Street between Oak Hill Drive and the bike crossing should be improved concurrently. On Woodside Lane, consider the provision of a sidewalk on the south side to the east side of Brattle as far as Millet Street, if feasible within the available right-of-way and acceptable to direct abutters.

Conclusion: The data indicates that the volume of traffic approaching Oak Hill Drive will not meet warrants for multi-way stop control at this intersection. Other traffic calming measures should be considered as an alternative to all-way stop control (e.g., a 'mild' non-jarring speed table).

Please contact me should you wish to discuss any aspect of this letter. FST appreciates the opportunity to provide these services on behalf of the TAC.

Very truly yours,

FAY, SPOFFORD & THORNDIKE

By

Gary L. Hebert, P.E., PTOE
Vice President

PA-015A
GLH:gh
Attachments: Synchro Summer at Hospital Road Queue summary sheets

M E M O R A N D U M

To:	**Patrick McMahon, EA Fish** **Jake Upton, EA Fish**	Date: **January 6, 2005**
From:	**James Danila** **Jane Howard**	HSH Project No. **2003156.00**
Subject:	**Westbound Summer St. at Hospital Rd. Right-Turn Pocket**	

Howard/Stein-Hudson Associates (HSH) was asked to perform an analysis of a proposed right-turn pocket on westbound Summer Street at Hospital Road. The purpose of this turning lane would be to provide additional storage space for westbound traffic, reducing the possibility of queues extending to the east and blocking Grove Street. The background conditions used for this analysis set were the same as the conditions used in Task 2.3 in a memorandum prepared by HSH dated December 20, 2004: full build-out traffic from the proposed Symmes Hospital site, a 10% increase over existing conditions in thru traffic along Summer Street, and coordinated traffic signals installed at the Grove Street and Woodside Lane intersections. Analysis was performed for both the Woodside Lane Open and Woodside Lane Closed conditions. For the purpose of this analysis, a 200-foot right-turn pocket along with a standard taper was used; please note that the feasibility of construction of this lane, including alignment, physical limitations, and possible land taking, etc., have not been considered.

A comparison of the results can be seen in **Table 1.**

Table 1. Queue Comparison

50th % Queues (ft.)	Single thru/right lane (ft.)	Thru lane + proposed right-turn pocket (ft.)	Difference (ft.)
Woodside Open, A.M.	266	250	16
Woodside Open, P.M.	530	356	174
Woodside Closed, A.M.	301	275	26
Woodside Closed, P.M.	630	362	268
95th % Queues (ft.)	**Single thru/right lane**	**Thru lane + proposed right-turn pocket**	**Difference**
Woodside Open, A.M.	#796	#718	78
Woodside Open, P.M.	#1061	#934	127
Woodside Closed, A.M.	#829	#713	116
Woodside Closed, P.M.	#1108	#920	188

#: 95th percentile volume exceeds capacity; queue is measured after two cycles and will rarely exceed this length.

HOWARD/STEIN-HUDSON ASSOCIATES, INC.
38 Chauncy Street, 9th Floor • Boston, Massachusetts 02111 • www.hshassoc.com
Phone (617) 482-7080 • Fax (617) 482-7417 • info@hshassoc.com

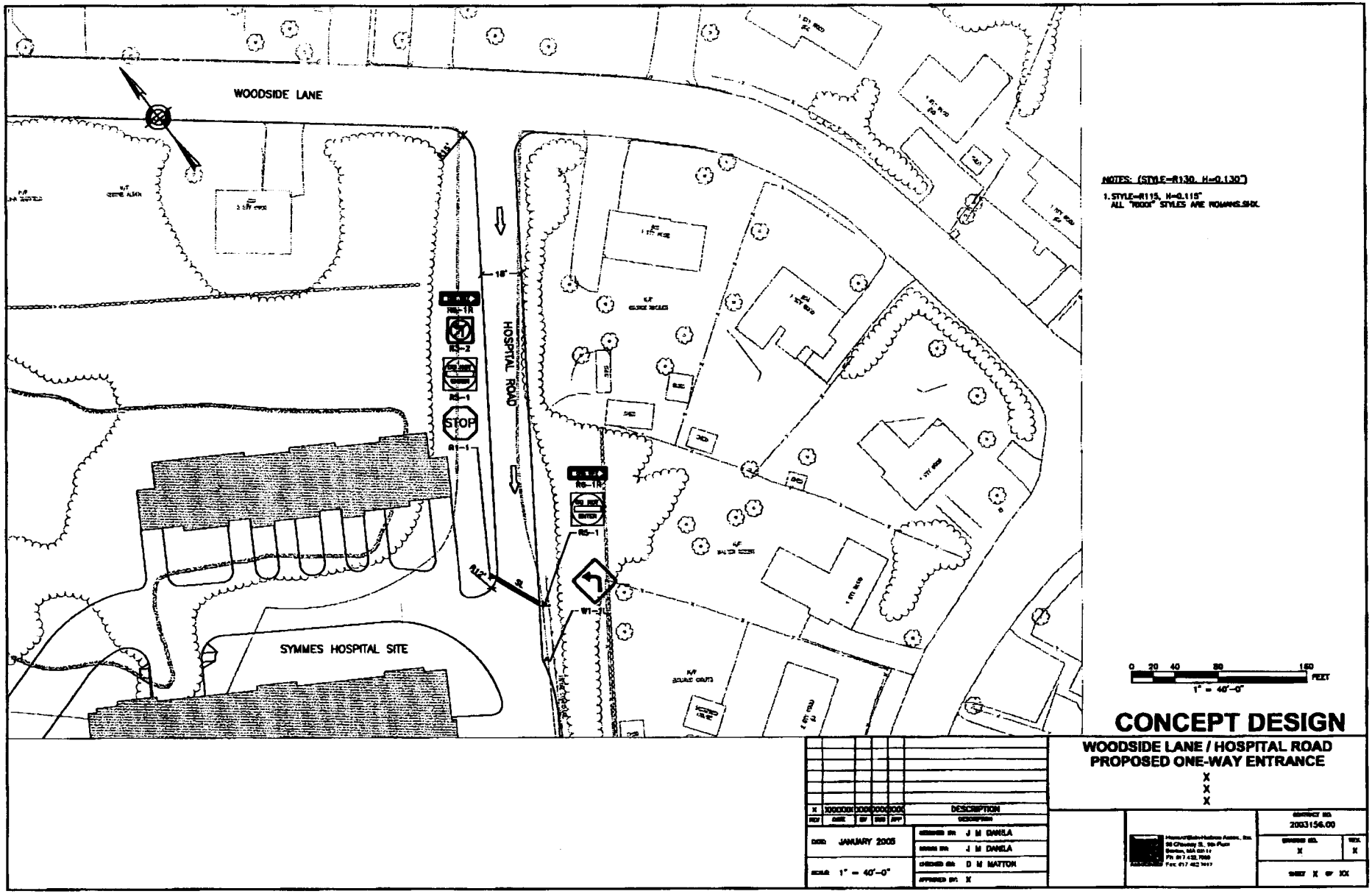
Outside of the difference in 50th percentile queue for the Woodside Lane Closed P.M. condition, the addition of the right-turn pocket decreased the queue lengths along westbound Summer Street by only a small margin. Full Synchro reports can be found in **Appendix A.**

In addition to the actual queue lengths, Synchro can also calculate how often the right-turn pocket will be blocked due to queues in the thru lane. The results of this analysis can be found in **Table 2.**

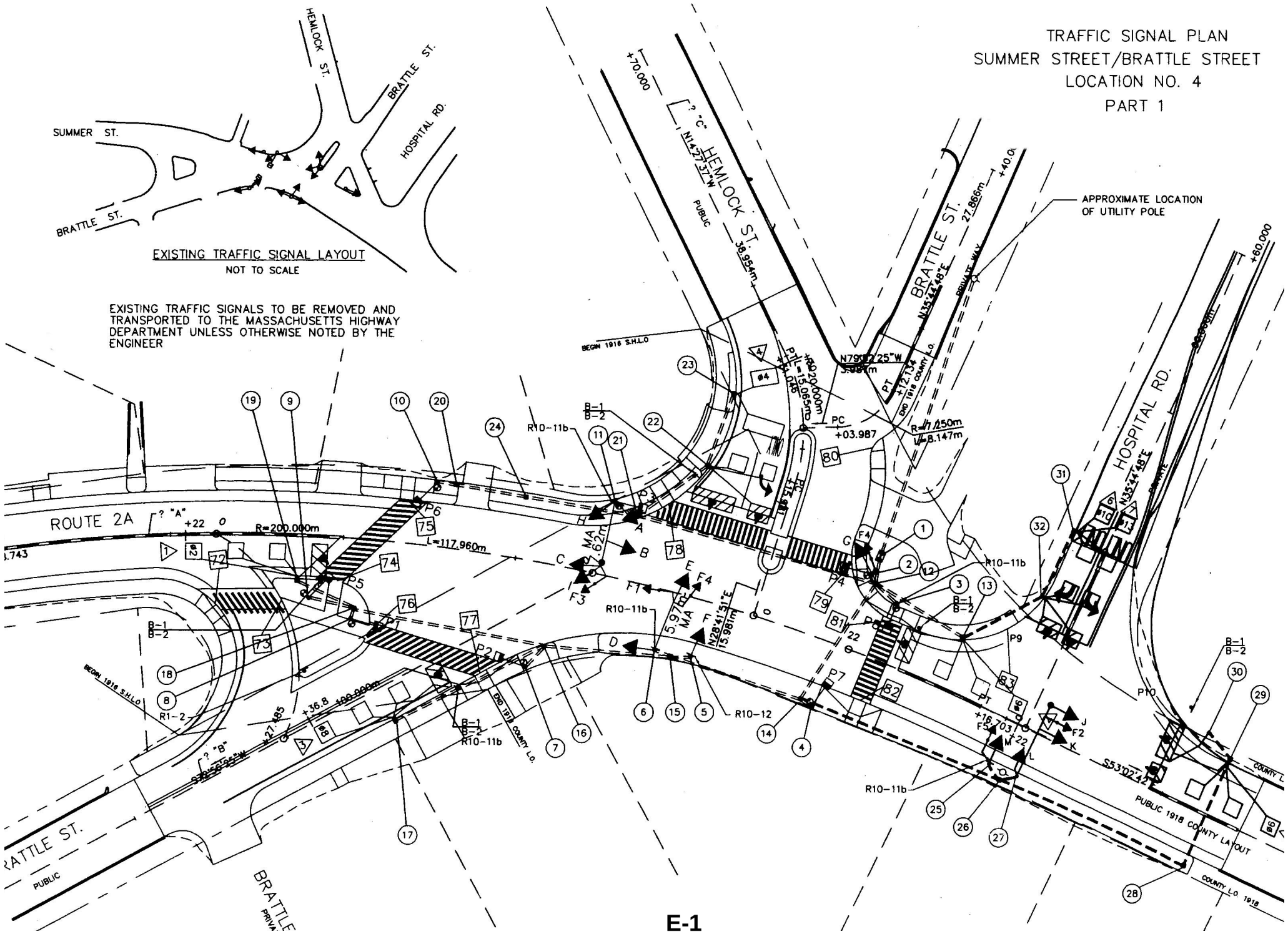
Table 2. Block Time

	50th % Block Time	95th % Block Time
Woodside Open, A.M.	20%	49%
Woodside Open, P.M.	9%	55%
Woodside Closed, A.M.	23%	58%
Woodside Closed, P.M.	25%	63%

As shown in the table, the turn-pocket will be blocked by traffic in the thru lane and not fully utilized between 9-25% of the time during 50th percentile traffic periods and 49-63% of the time during 95th percentile traffic periods.



DRAWING PREPARED BY HOWARD/STEIN-HUDSON ASSOCIATES, INC.


TRAFFIC SIGNAL PLAN
SUMMER STREET/BRATTLE STREET
LOCATION NO. 4
PART 1
HEMLOCK ST.
BRATTLE ST.
HOSPITAL RD.
SUMMER ST.
BRATTLE ST.
EXISTING TRAFFIC SIGNAL LAYOUT
NOT TO SCALE
EXISTING TRAFFIC SIGNALS TO BE REMOVED AND TRANSPORTED TO THE MASSACHUSETTS HIGHWAY DEPARTMENT UNLESS OTHERWISE NOTED BY THE ENGINEER
APPROXIMATE LOCATION OF UTILITY POLE
ROUTE 2A
HEMLOCK ST.
BRATTLE ST.
HOSPITAL RD.
PUBLIC 1918 COUNTY LAYOUT
R=200.000m
L=117.960m
R=20.000m
R=7.250m
R10-11b
R10-12
R1-2
B-1
B-2
PC
PT
PUBLIC
PRIVATE WAY

Conclusions from Meeting with Police and Fire on 2/7/05

Attendees: Department Chief Springer of AFD, Lt. McHugh, Chief of the Traffic Division of APD, Ed Starr, Chair of TAC, and Elisabeth Carr-Jones of the TAC

Topic: Emergency Access Requirements for Symmes Development

1. Fire and Police require two entrances to Symmes for emergency matters.

2. This minimum requirement to meet this is a one-way access **into** the site with a width of 18 feet.
    a. Two way access is also acceptable.
    b. A locked gate will not meet this requirement.

3. This access is to have no speed humps or other items that would delay access.

4. It is required that Hospital Road be a Public Way so that the APD can enforce regulations.
    a. It is preferred that other roadways on the site also be public ways, but the minimum requirement is that adequate fire lanes be designated which will be enforced by APD.

5. Prior to issuing the Special Permit, APD and AFD require a review and approve the plans for the roadways.

6. During construction while the site is not occupied only, a chain that can be cut quickly with a heavy tool can obstruct access.

Traffic Volume Analysis: Woodside Lane / Hospital Road Access

Table 1 shows approximate travel time savings (in minutes) for the back routes (via the access to Woodside Lane). The "off peak" column is based on a simple estimation (based on distance and road type, e.g. Summer Street is faster than Millett) estimation of travel time with minimal (18-second) signal delay. The peak period column considers signal delay as estimated by Howard Stein Hudson. In this table, a negative number (in parentheses) indicates that the shortest time route is via the Hospital Road/Summer Street intersection.

Table 1 Travel Time Savings for Back Routes (minutes)

Corridor	UserGroup	Period	Users per Hour	Off Peak (little signal delay)	Peak Period
To the East	Site Residents	AM Outbound	35	0.5	0.8
To the North	Site Residents	AM Outbound	12	0.5	0.8
To the South	Site Residents	AM Outbound	39	(0.7)	(0.4)
To the West	Site Residents	AM Outbound	27	(1.4)	(1.1)
From the East	Site Visitors	AM Inbound	32	(0.7)	(0.4)
From the North	Site Visitors	AM Inbound	12	0.5	0.8
From the South	Site Visitors	AM Inbound	19	(0.3)	0.0
From the West	Site Visitors	AM Inbound	22	(1.4)	(1.4)
To the East	Area Residents	AM Outbound	19	1.5	1.8
To the North	Area Residents	AM Outbound	6	1.5	1.8
To the South	Area Residents	AM Outbound	21	0.2	(0.2)
To the West	Area Residents	AM Outbound	14	0.2	0.4
From the East	Site Residents	PM Inbound	39	(0.7)	(0.4)
From the North	Site Residents	PM Inbound	13	0.5	0.8
From the South	Site Residents	PM Inbound	43	(0.3)	(0.0)
From the West	Site Residents	PM Inbound	30	(1.4)	(1.4)
To the East	Site Visitors	PM Outbound	52	0.5	0.9
To the North	Site Visitors	PM Outbound	20	0.5	0.9
To the South	Site Visitors	PM Outbound	30	(0.7)	0.1
To the West	Site Visitors	PM Outbound	36	(1.4)	(0.9)
From the East	Area Residents	PM Inbound	14	1.5	1.8
From the North	Area Residents	PM Inbound	5	1.5	1.8
From the South	Area Residents	PM Inbound	15	0.2	1.0
From the West	Area Residents	PM Inbound	10	0.2	0.2

Preliminary Results

Assume logit model for route choice:

Share(Back route) = exp(A + B?T)/(1 + exp(A + B?T)), where

A = Constant for back route: 0 for site and area residents, -2.25 for Summer Street commuters and site visitors/employees. The –2.25 was chosen to produce a 10% back route share for current usage.

B = Coefficient of travel time: -1
?T = Difference in travel time, in minutes.

Current conditions refers to the model applied to current conditions. It does not refer to actual counts.

Table 2 Modeled Volumes (Vehicles per peak hour)

	Period	Current	Open	Closed	OneWay
Approximate Peak Hour Volumes					
Exiting area via Hosp/Summer	AM Peak	13	79	113	133
Exiting area via lower Woodside	AM Peak	38	88	46	34
Exiting area via Brattle/Millett	AM Peak	24	14	24	16
Entering area via Hosp/Summer	AM Peak	26	78	85	77
Entering area via lower Woodside	AM Peak	13	11*	7*	13*
Entering area via Brattle/Millett	AM Peak	11	7*	7*	8*
Exiting area via Hosp/Summer	PM Peak	35	119	138	138
Exiting area via lower Woodside	PM Peak	6	16*	1*	1*
Exiting area via Brattle/Millett	PM Peak	14	11*	8*	6*
Entering area via Hosp/Summer	PM Peak	12	85	125	73
Entering area via lower Woodside	PM Peak	36	69	39	76
Entering area via Brattle/Millett	PM Peak	12	23	14	28
Peak Hour Percentages					
Site Residents using Woodside or Brattle/Millett	Both peaks	N/A	45%	0	22%
Site Visitors using Woodside or Brattle/Millett	Both peaks	10%	11%	0	4%
Area Residents using Hospital	Both peaks	23%	31%	0	20%

* Does not include neighborhood residents entering the area during the AM peak period, or exiting the area during the PM peak period.

It is important to note that during off peak hours, the fraction of travelers using the back routes will be somewhat lower, because there will be less congestion at the Summer/Hospital intersection. Table 3 shows a very rough estimate of DAILY volume using the Woodside lane access (in both directions):

Table 3 Estimated Daily Vehicles Using the Woodside Lane Access

		Access open		Access open one-way inbound	
		Fraction Using	Vehicles	Fraction Using	Vehicles
Site Residents	1494	40%	598	20%	299
Site Visitors	1244	10%	124	4%	50

Symmes Transportation Subcommittee
Bicycle and Pedestrian Working Group Priorities

Summer Street

Supported by Group:

- *Improve safety and driver compliance at Oak Hill Drive crosswalk
- Install sidewalk between Hospital Road and Oak Hill Drive
- Retain crosswalk from NW corner of Brattle to SE corner of Brattle
- Install pedestrian only signal at Grove Street / Oak Hill Drive
- Complete sidewalks from Oak Hill Drive to Cutter Hill Road

Mixed Support by Group:

- Extend redesigned Summer Street roadway width east to Oak Hill
- Restrict parking on south side of Summer from Grove St to Mill St

Not Supported by Group:

- Install full traffic signal at Grove Street / Oak Hill Drive

Hospital Road

Supported by Group:

- *Install sidewalk on Hospital Road, at least on east side
- Install wider sidewalk on Hospital Road to accommodate cyclists
- Add bus stop at medical office building
- Install crosswalk on Hospital Road approach to Summer Street

Mixed Support by Group:

- Install pedestrian path from Hospital Rd to Summer near Grove
- Install bike lanes or wider travel lanes on both sides of roadway

Not Supported by Group:

- Add inbound bus service to top of site

Minuteman Bikeway

Supported by Group:

- *Improve safety of Bikeway crossing at Mill Street
- Install access stairs from Bikeway to Grove Street
- Install ramp on Summer St at access to Bikeway behind High School

Mixed Support by Group:

- Install access stair from Bikeway to High School fields
- Improve Brattle Place roadway for cyclist access (private way)

Woodside Lane

Supported by Group:

- *Install sidewalk on south side of Woodside Lane

Mixed Support by Group:

- Install curb extensions on Woodside at Oak Hill intersection
- Install additional street lights on lower Woodside Lane

Oak Hill Drive

Supported by Group:

- Redesign geometry of Summer/Oak Hill intersection

Mixed Support by Group:

- Install all-way stop with crosswalks at Woodside intersection

Hemlock Street/Stratton School

Supported by Group:

- Install a crosswalk on Hemlock at redesigned NW corner of Brattle St

Mixed Support by Group:

- Install sidewalks on upper Hemlock, Dickson Ave and Mountain Ave

* ranked high priority by everyone voting

Symmes Trip Generation Comparison

Symmes Transportation Subcommittee, Arlington Transportation Advisory Committee
16 September 2004

Symmes Advisory Committee Recommendation

The Symmes Advisory Committee (SAC) determined that the traffic generated by Symmes Hospital in full operation should be considered the upper limit for the traffic generated by any proposed development on the site. From page 8 of the SAC *Recommendations to Special Town Meeting* dated May 5, 2003:

> *REQUIREMENT: Development shall be limited to the total number of peak-hour vehicle trips that were generated when the hospital was in full operation (estimated to be **375** vehicles during the evening peak hour as noted in Appendix I).*

Note: no traffic counts were conducted during the period when the hospital was in full operation.

Vanasse Hangen Brustlin Estimates

Appendix I of the SAC report is the *Symmes Hospital Reuse Alternatives Transportation Assessment* memo from Vanasse Hangen Brustlin (VHB) dated February 13, 2003 and Revised April 17, 2003. From page 1 of the VHB memo:

> *Prior to construction of the 61,500 square foot North Wing in 1984, actual traffic counts indicated that the former hospital with approximately 112,000 square feet and Nurses Building with 25,000 square feet generated 245 vehicle trips during the morning peak hour and **255** vehicle trips during the evening peak hour, rates that are similar to industry standards for hospital uses. Based upon counts conducted in 1982, it is estimated that Symmes Hospital at full-build generated **375** vehicle trips during the evening peak hour.*

From page 8 of the VHB memo:

> *To obtain a more accurate estimate of the amount of traffic generated by Symmes Hospital when in full operation, a trip generation rate based on the counts was determined. Prior to the addition of the North Building, the combined 136,500 square foot campus generated up to **255** vehicle trips per hour, the equivalent of 1.87 trips per 1,000 square feet. Therefore, the full build facility at 200,000 square feet would generate up to **375** vehicle trips per hour. Utilizing ITE rates for a 175,000 square foot hospital (LUC 610) and a 25,000 square foot medical office (LUC 720), it is estimated that the Symmes campus would have generated up to 365 vehicle trips per hour. This estimate, which is very similar to the counts based estimate, validates these findings.*

An earlier VHB memo, *Symmes Hospital Reuse Alternatives Draft Transportation Alternatives,* dated January 8, 2003, estimated the daily traffic for the hospital in full operation to be **4,540** vehicle trips per day. The estimate appears in *Table 4 Trip Generation Comparison* on page 7. As noted below the Table, the calculation was based on ITE Land Use Codes 610 (Hospital) for 175,000 square feet and 720 (Medical-Dental Office Building) for 25,000 square feet.

Howard/Stein-Hudson Projections

On September 13, 2004, Howard/Stein-Hudson (HSH) released the *Symmes Hospital Redevelopment Transportation Overview*. From page 29 of the HSH study:

> *Trip generation data were derived from the Institute of Transportation Engineers (ITE) Trip Generation, 7th edition (2003). Trips were calculated on a per-dwelling-unit basis. The trips are then reallocated to vehicle, transit and walk/bike trips based on the area mode split (described in the next section).*

Page 31 of the HSH study lists the ITE Land Use Codes used for their calculations as LUC 230 (Residential Condominium) and LUC 720 (Medical-Dental Office Building). From page 32 of the HSH study:

> *As shown, the project will generate a total of 1,369 entering and 1,369 exiting vehicle trips each day. These include 85 vehicle trips entering and 113 vehicles exiting during the A.M. peak hour and 125 vehicle trips entering and 138 exiting during the P.M. peak hour.*

From page 33 of the HSH study, *Table 15. Comparison of Vehicle Trips* shows the Total Project Trips to be **263** during the PM peak hour, with an Average Daily Total of **2,738** vehicle trips per day.

Fay, Spofford and Thorndike Review

Gary Hebert of Fay, Spofford and Thorndike (FST) summarized his peer review findings on the HSH study in a letter to the Transportation Advisory Committee and the Arlington Redevelopment Board dated September 15, 2004. The subject of letter is *Peer Review - Symmes Redevelopment Plan Traffic Impact Study and Mitigation Plan*. From section 1.4 on page 3 of the FST letter:

> *An independent check of the trip generation calculations indicates that they were performed correctly.*

Conclusion

The projected peak period traffic volumes for the Symmes redevelopment project will be comparable to those observed in 1982, before the North Wing was built, and are projected to be substantially less than the peak period volume when the hospital was in full operation.

Symmes Trip Distribution Comparison
Symmes Transportation Subcommittee, Arlington Transportation Advisory Committee
18 March 2005

Symmes Advisory Committee Recommendation

The Symmes Advisory Committee (SAC) determined that Summer Street should be the primary access for any proposed development on the Symmes site and that there should be limits on the amount of traffic on Woodside Lane. From page 8 of the SAC Recommendations to Special Town Meeting dated May 5, 2003:

> *REQUIREMENT: Primary access to the site shall be from Summer Street.*
>
> *REQUIREMENT: Woodside Lane shall remain a low-volume local roadway. No proposal should suggest that more than 10 percent of non-residential peak-hour site traffic would utilize Woodside Lane. Proposals suggesting programs to minimize use of Woodside Lane, including the installation of a traffic monitoring program, are encouraged.*

Howard/Stein-Hudson Trip Generation Projections

On page 32 of their *Symmes Hospital Redevelopment Transportation Overview* dated September 13, 2003, Howard/Stein-Hudson (HSH) calculated that the 370,000 square foot residential component of the proposed Symmes development would generate 1,494 vehicle trips per day (55% of the total traffic) and the 40,000 square foot medical component would generate 1,244 vehicle trips per day (45% of the traffic).

Fay, Spofford and Thorndike Trip Generation Review

In page 3 of a letter to the Transportation Advisory Committee and the Arlington Redevelopment Board dated September 15, 2004, Peer Reviewer Gary Hebert of Fay, Spofford and Thorndike (FST) reviewed these calculations and concluded that, "An independent check of the trip generation calculations indicates they were performed correctly."

Howard/Stein-Hudson Trip Distribution Projections

On page 41 of their *Symmes Hospital Redevelopment Transportation Overview* dated September 13, 2003, Howard/Stein-Hudson predicted that 26.2% of the traffic generated by the residential component of the proposed Symmes development (391 vehicle trips) and 33.2% of traffic generated by the medical component (413 vehicle trips) would use the Woodside access if it were to remain open to traffic in both directions. This translates to a total of 804 vehicle trips per day (29% of the total projected trips of the development) predicted to use the Woodside access if it were to remain open in both directions.

Transportation Advisory Committee Trip Distribution Projections

TAC member Scott Smith conducted an independent analysis of the trip distribution for the proposed Symmes development. TAC's analysis predicts that 40% of the projected traffic generated by the residential component of the development (598 vehicle trips) and 10% of the projected traffic generated by the medical component (124 vehicle trips) would use the Woodside access if it were to remain open in both directions. This translates to a total site of or 722 vehicle trips per day (26% of the total traffic generated by the development) predicted to use the Woodside access if it were to remain open in both directions.

TAC's analysis was also used to predict the amount of traffic that would use the Woodside access if it were open in one direction (into the site). The analysis predicts that 20% of the projected traffic generated by the residential component of the development (299 vehicle trips) and 4% of the medical component (50 vehicle trips) would use the Woodside access if it were open in one direction. This translates to 349 vehicle trips per day (13% of the total traffic generated by the development) predicted to use the Woodside access if it were open in one direction.

Estimates of Traffic when the Hospital was in Full Operation

As stated in the *Symmes Trip Generation Comparison*, no traffic counts were conducted when the Hospital was in full operation. In 1982, prior to the construction of the North Wing of the Hospital, 12-hour traffic counts were conducted on Hospital Road at the Summer Street and Woodside Lane accesses. These 6 AM - 6 PM counts measured a total of 1,939 vehicle trips, with 1,700 vehicle trips through the Summer Street access (88% of the total) and 239 vehicle trips through the Woodside access (12% of the total).

Based on the 1982 counts, on page 6 of the February 17, 2005 Status Report FST extrapolated that there were 385 vehicle trips per day using the Woodside access before the construction of the North Wing. The 63,500 square foot North Wing added 32% to the total area of the Hospital (which went from 136,500 to 200,000 square feet). In their *Symmes Hospital Reuse Alternatives Transportation Assessment* memo dated February 13, 2003, Vanasse Hangen Brustlin (VHB) estimated that Hospital in full operation generated 4,540 vehicle trips per day (see TAC document *Symmes Trip Generation Comparison* for information on this estimate).

Based on the available information, two methods can be used to estimate the traffic using the Woodside access when the Hospital was in full operation. If we were to assume a 32% increase in traffic (based on the Hospital area increase) from the extrapolation by FST, 508 vehicles per day would have used the Woodside access. If we were to assume 12% of the VHB estimated total vehicle trips per day generated by the Hospital in full operation (based on the percentage indicated in the 1982 counts), 545 vehicle trips would have used the Woodside access. Based on this, we can estimate that between 500 and 550 vehicle trips per day would have used the Woodside access when the Hospital was in full operation.

Using the VHB estimated total trip generation of 4,540 vehicle trips per day, and an estimated 500 to 550 vehicle trips per day using the Woodside access, we can estimate that between 3,990 and 4,040 vehicle trips per day would have passed through the Summer Street access when the Hospital was in full operation.

Conclusion

Both HSH's prediction of 804 vehicle trips per day and TAC's prediction of 722 vehicle trips per day using the Woodside access if it were open in both directions are substantially more than the 500-550 vehicle trips estimated to have used the Woodside access when the Hospital was in full operation.

TAC's prediction of 349 vehicle trips per day using the Woodside access if it were open in one direction would be substantially less than the 500-550 vehicle trips estimated to have used the Woodside access when the Hospital was in full operation.

Regardless of the Woodside access conditions, the vehicle trips per day using the Summer Street access would be substantially less than the 3,990 and 4,040 vehicle trips estimated to have used the Summer Street access when the Hospital was in full operation.