PROJECT: 15 GREAT ROAD

TRAFFIC STUDY

DOCUMENT CONTROL LIST

Updated March 6, 2012

Document 28: Plan dated 11-14-11 showing Emergency Access thru 27-28

Document 29: January 11, 2012 letter from VHB – Traffic Study Review

Document 30: Email from VHB re: Mass DOT meeting January 31, 2012

Document 31: Letter from Bayside Engineering dated February 28, 2012

(29)

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January 11, 2012

Vanasse Hangen Brustlin, Inc.

Ref: 11855.00

Ms. Sherrill R. Gould, Chair
Littleton Appeals Board
Town of Littleton
Shattuck Street
Municipal Building Room 303
Littleton, MA 01460

Re: Proposed Comprehensive Permit (40B) Development
15 Great Road
Littleton, MA
Traffic Review Comments

Dear Ms. Gould:

VHB/Vanasse Hangen Brustlin, Inc. (VHB) has performed a technical review of the Traffic Impact and Access Study and associated site plans for the proposed residential development to be located at 15 Great Road in Littleton, Massachusetts. As part of this effort, VHB reviewed the following documents:

- ***Traffic Impact and Access Study for "Proposed Residential Development", 15 Great Road, Littleton, Massachusetts;*** dated October 19, 2011 and prepared by LandStrategies, LLC.
- ***Conceptual Improvement Plan for "Proposed Apartments", 15 Great Road, Littleton, Massachusetts;*** dated December 13, 2011 and prepared by Bayside Engineering.
- ***"Figure A" Sight Distance Profiles for "Proposed Residential Development", Littleton, Massachusetts;*** dated December 13, 2011 and prepared by Bayside Engineering.
- ***Site Plans (Plan Nos. CP-4 to CP-7) and Landscape Plan (Plan No. CP-9) for 40B Comprehensive Permit Application "Village Green Apartments", 15 Great Road Littleton, Massachusetts.*** The plan is dated July 2011 and prepared by Place Associates, Inc.
- ***Additional correspondence, technical studies, reports, etc.. provided on the Town of Littleton's website (www.littletonma.org) as it relates to this project (information posted to the website as of January 3, 2012).***

101 Walnut Street
Post Office Box 9151
Watertown, Massachusetts 02471-9151
617.924.1770 ▪ FAX 617.924.2286
email: info@vhb.com
www.vhb.com

INTRODUCTION

For the purposes of this review, it was assumed that the project meets the eligibility criteria for a comprehensive permit. VHB's role in this effort is to focus on the engineering and technical merits of the traffic study as well as the driveway and roadway plans submitted in support of the Comprehensive Permit application.

It should also be noted that because the project abuts a State Highway (Route 2A/119) and is expected to generate in excess of 1,000 daily trips and create more than 150 new parking spaces on the site, it triggers the need for filing an Environmental Notification Form (ENF) with the Executive Office of Energy and Environmental Affairs (EEA) as part of the Massachusetts Environmental Policy Act (MEPA). Additionally, the project will require a Highway Access Permit to be issued by the Massachusetts Department of Transportation (MassDOT) for the final design and layout of the site driveway intersection. During this period, MassDOT will have the authority to review and evaluate the adequacy of the intersection design. This letter and its commentary and findings is not intended to replace the MassDOT technical review or supplement it in any way as that is a completely separate regulatory process from the local effort.

It should be noted that VHB was informed by the Town's project coordinator (Mr. Edward Marchant) that a revised set of site plans were being prepared by the developer and would be forwarded when received by the Town. In discussions with the developer, this was confirmed to VHB. It was noted that changes to the plans were expected to include the elimination of the full access connection to Grist Mill Road (and alteration to provide for emergency access only). However, as of the publication date on this memorandum, VHB has not received the revised site plan set noted.

For the purposes of this evaluation, it is assumed that the connection to Grist Mill Road is no longer being sought. Should the site plans be resubmitted with a full access connection to Grist Mill Road, VHB reserves the right to review the connections and impacts to that roadway and the neighborhood impacts associated with its connection.

SUMMARY REVIEW OF THE TRAFFIC STUDY

In general, the traffic report and supporting plans have been prepared in a professional manner that is generally consistent with standard engineering practices. As part of this effort, VHB has conducted a detailed, point-by-point evaluation of the study and its supporting documentation. It is our professional opinion that the information contained in the report is both technically sound and portrays the likely impacts of the project on the surrounding roadway system.

That said, VHB has identified additional informational needs that the applicant should provide to the board which would clarify inconsistencies, provide additional insight, and/or address

technical issues raised in this letter. For the purposes of brevity, VHB is providing these requests below. A full, detailed, commentary on the traffic study and plans follows.

Technical Issue #1:: Driveway Sight Distance

VHB has asked the applicant to provide additional information relative to the placement of the driveway and sight lines which should formally be submitted for review through the Board. VHB has asked the design engineer to provide additional information and perform additional calculations based on the following considerations:

- Recognizing that the ideal location for the driveway is at the crest of the vertical curve, can the driveway be shifted to the east slightly? If so, how far? If not, what are the physical (structures?) or regulatory (wetland impacts?) limitations to shifting it in this direction? Furthermore, have feasible solutions to these 'limitations' been considered?

- Assuming that the driveway cannot be shifted to the east, what other actions (advanced signage, removing line-of-sight obstructions, re-grading, etc...) might improve the sight lines and/or warn approaching drivers of the intersection location?

Technical Issue #2:: Emergency Vehicle Access and Circulation

Based on our review, no information has been provided showing if emergency response vehicles can successfully negotiate the current site plan. Additionally, both the Fire and Police departments have commented that accessibility to certain buildings is a concern. With this in mind, the applicant should provide a site plan showing how emergency vehicles will travel through the site. This plan should show not only access to the various buildings, but also should show the vehicles path through the project site as they arrive and depart from each of the buildings within the site. The analysis should be conducted using the commercially available program AutoTurn© (or similar) which is based on actual measurements of the emergency vehicle apparatus that would likely respond to an event at this facility. The plan should demonstrate that no physical limitations exist for the circulation of these vehicles throughout the site.

Technical Issue #3:: MassDOT Coordination

As noted previously, the project will need to be reviewed and approved by MassDOT as part of their highway access permit process. The applicant has indicated that they have had preliminary discussions with MassDOT relative to the modifications proposed at the site driveway. The applicant should provide an update to the Town on the status of this review and any additional comments that MassDOT may raise as part of that process.

DETAILED REVIEW OF THE TRAFFIC STUDY

Understanding that the summary review of the traffic study preceding this section is brief, the following section provides a step-by-step review of the traffic study and it's supporting information. The following comments are offered to the Town for their use in evaluating the accuracy and resulting impacts of the proposed development. Throughout the comments noted below, there are a few requests for additional technical information *in italics*. The applicant should provide written responses to these comments and/or provide the requested information to complete the technical review of the documents.

Project Description

- The study reviews the traffic impacts associated with the proposed project. For reference purposes, the project description notes that the project will include 200 residential apartment units to be located at the subject address. The study states that the project site will provide 383 parking spaces.

Existing Roadway Characteristics

- The description of the roadways and intersections within the project's study area is generally consistent with our observations and understanding of the roadway use.
- Surrounding land uses descriptions in the vicinity of two intersections are generally comprehensive, but should also include :
    - Great Road at Nashoba Road – Land uses in the vicinity of this intersection include *retail to the north and the Nagog Pond to the east*, in addition to the residential uses noted.
    - Great Road at Grist Mill Road (west) – Land uses in the vicinity of this intersection include *the Oak Meadow Montessori School to the south*, in addition to the residential uses noted.

Baseline Traffic Data

- The study area selected for the project is consistent with standard engineering principles. It focuses on the proposed primary driveway and the two closest intersections to the east and to the west that would be reasonably and measurably impacted by this proposal.
- Traffic data was collected in May 2011. This is generally a reasonable time period from which to collect data and base future assessments for (schools are open, generally good weather, etc...). The study states that weekday evening peak period turning movement counts

(TMCs) were conducted from 4:00-6:00 PM (as is standard industry practice). However, the traffic volume data included in the Appendix material includes TMC data collected from 4:30-6:30 PM for the evening peak period. This is not a significant issue, but *the report should be corrected to reference the correct times of observations.*

- The study states that individual intersection peak hours were used in the analysis but the traffic volume networks (Figure 2 and Figure 3) seem to indicate that a network peak hour was used. Based on a review of the count data provided in the Appendix, there does not appear to be a measurable difference between the individual and network peak hours and therefore, no revision to the traffic volumes is recommended.

Intersection Crash History

- The crash data presented in the study indicates that crash rates at all study area intersections are below the statewide average for this region ~ thus indicating that the existing intersections and roadway links are operating in a reasonably safe manner.

Vehicle Speeds

- Existing speed data was collected using automatic traffic recorders (ATRs), a methodology that is consistent with industry standards.
-
- VHB has reviewed the data provided and notes that the data provides a reasonable estimation of speeds along the corridor. Additionally, VHB visited the site during off-peak traffic periods to observe speeds and how the traffic along Great Road flows past the project site. It is our opinion that the 43 and 48 mile per hour speeds used in the study are a reasonable baseline from which to determine sight distance measurements (noted below).

Sight Distance

- The applicant provides a discussion on the sight distance at the proposed driveway. The descriptions of sight distance discussion is consistent with the AASHTO definitions and the applicant correctly reviews both stopping sight distance (SSD) as well as intersection sight distance (ISD).

- Within the discussion of the traffic study, the applicant identifies that the stopping sight distance can be met for both the eastbound and westbound directions along Great Road. It is important to note for ZBA members that meeting the distances by 1 foot or 100 feet is irrelevant as factors-of-safety are already built into the required distances. The fact that the SSD is met is all that is important.

- With respect to the intersection sight distance, the applicant acknowledges that the placement of the proposed driveway presents certain challenge with respect to meeting the 'recommended' ISD measurements for a particular direction. However, the applicant also notes that it can meet the 'minimum' ISD measurement and provides the applicable guidance from AASHTO in this regard.

- As a general practice, wherever reasonably feasible, the recommended values should be used. Only when the recommended values cannot be reasonably achieved should lesser values be considered. It is important that the design engineer apply every reasonable effort to make the recommended sight distance available; but it is generally understood that in some cases the difficulty in doing so is unreasonably disproportionate to the benefits gained.

  To this extent, VHB has asked the design engineer to provide additional information and perform additional calculations based on the following considerations:

  - *Recognizing that the ideal location for the driveway is at the crest of the vertical curve, can the driveway be shifted to the east slightly? If so, how far? If not, what are the physical (structures) or regulatory (wetland impact) limitations to shifting it in this direction? Furthermore, have feasible solutions to these 'limitations' been considered?*

  - *Assuming that the driveway cannot be shifted to the east, what other actions (advanced signage, removing line-of-sight obstructions, re-grading, etc…) might improve the sight lines and/or warn approaching drivers of the intersection location?*

- The applicant notes that a sight line triangle should be provided along the project frontage and that any line-of-sight obstructions should be removed and that future plantings should be limited in height. *The Board should consider requesting a sight distance easement be provided from the applicant for any portion of this sight triangle that is on privately owned property.*

- It also notes an area of regarding adjacent to Great Road should be conducted to assist in extending the sight lines for drivers exiting the project site driveway. *This area of regarding should be shown graphically on the site plan.*

Future No Build Traffic Conditions

- The study has selected a 5 year future buildout year which is consistent with industry standards.

- The study notes that traffic volumes observed in the area have generally decreased, but has utilized a 0.5 percent growth rate over the 5 year build out period. Given that this is consistent with general growth projections in the region, this is a reasonable estimate.

- The applicant has stated that they have contacted the Towns of Littleton and Acton to identify other projects in the vicinity of Great Road which might further increase traffic above and beyond the 0.5%/year noted previously. The applicant noted that there are three (3) projects that might impact traffic patterns within the area according to the communities. They include:

    - a 108 unit apartment development,
    - the redevelopment of the former Cisco site at I-495, and
    - a 153 unit senior community at the Quail Ridge Country Club.

  The study notes that site-generated traffic volumes were calculated based on Institute of Transportation Engineers (ITE) standard procedures and added to the No-Build traffic volume networks. The Town of Littleton should confirm that these developments are the only projects of significance likely over the next 5 years.

Trip Generation

- Using Institute of Transportation Engineers (ITE) data for land Use Code 220 (Apartments), the study indicates that the proposed project (200 apartment units) would generate 102 vehicle-trips during the morning peak hour and 128 vehicle-trips during the weekday evening peak hour. VHB has experience with residential developments of this type and concurs with the methodology used to develop these trip generation estimates.

Trip Distribution

- VHB concurs with the means and methods used to distribute traffic along area roadways.

Intersection Operations

- VHB has evaluated the analysis provided within the report and finds that it was prepared to industry standards and is a valid representation of the actual in-field conditions and likely projections of future traffic conditions.

- According to Table 10, the study has identified that there are several movements that will be directly impacted by this proposal within the study area. These include:

    - *Great Road at Grist Mill Road (west) southbound left-turn/right-turn: Weekday Evening Peak Hour.* This approach will degrade from LOS D under 2016 No-Build conditions to LOS E under 2016 Build conditions with the introduction of additional through traffic volumes along Great Road.

- *Great Road at proposed site drive southbound left-turn/right-turn: Weekday Morning and Weekday Evening Peak Hours.* This approach is projected to operate at LOS E during the weekday morning peak hour and LOS F during the weekday evening peak hour under 2016 Build conditions.

This is highlighted so as to point out that there are some impacts associated with the project on surrounding roadway intersections. However, where there are impacts, the study also notes mitigation recommendations to address these impacts, which are noted in the next section.

Great Road at Site Driveway Recommendations

- The study notes that traffic volumes generated by the project are not high enough to warrant signalization of the site driveway. While that appears to be a supportable statement, no documentation is provided to verify this statement. *The applicant should provide a basic 'peak hour' traffic signal warrant for the site driveway confirming that signalization is not a supportable/warranted option for addressing the operations at this location.*

- On page 28, the study notes: "Additional analyses were performed assuming the intersection were to be signalized. These analyses indicate that the intersection would operate at LOS A during both the weekday morning and evening peak hours. This significant improvement in operating conditions indicates that the projected unsignalized analyses will not be as poor as the capacity analysis model indicates." It is unclear how and why this conclusion was reached as it is not standard industry practice to make the comparison as the study suggests.

- That said, it should be noted that it is not uncommon for the highway capacity software to overstate the level of delay for the minor approach to unsignalized intersections.

- The study recommends widening Great Road to provide a left-turn lane into the site. *The applicant should provide technical justification for providing a left-turn lane into the project site driveway as well as an analysis of how the left-turn might improve intersection operations.*

- Lastly, the study recommends maintaining a sight distance triangle along the site frontage. VHB supports this recommendation as it is a requirement of providing safe and efficient access. See comment previously in the Sight Distance discussion about the sight triangle.

Comments on the Site Plan

In reviewing the site plan from an on-site circulation perspective, VHB offers the following comments (note that specific issues relating to site plan review are not directly covered as part of this effort):

- A waiver was requested to permit parking supply of less than the zoning requirement of two (2) spaces per dwelling unit. The site plan appears to offer 334 parking spaces (including 14 accessible parking spaces). This is 49 spaces less than the proposed parking supply highlighted in the traffic study of 383 parking spaces. *The applicant should confirm the number of parking spaces to be provided.*

- A circulation diagram demonstrating that access for emergency vehicles can easily maneuver through the site was not provided. It is important for safety reasons that the applicant provide a drawing which clearly shows the routes and pathways that an emergency response vehicle would need to travel through the site. *The applicant should provide a detailed plan showing how an emergency vehicle would enter the project site, travel through it to each of the buildings located within the development, and exit the site. The plan should demonstrate that there are no areas where emergency vehicle response would be impeded by physical obstructions.*

- A comment letter from the Littleton Police Department dated September 7, 2011 notes under comment 4 "No emergency vehicle access to the rear of buildings #1, #5, and #6." The police department letter goes on to suggest investigation of a roadway connection to the rear of buildings #5 and #6 to facilitate emergency vehicle access. *The applicant should demonstrate how this comment has been addressed.*

- In a letter dated April 19, 2011, the Littleton Fire Department also notes that turning radius diagrams were not provided and that they have concerns about accessibility to only one side of the buildings. *The applicant should demonstrate how this comment has been addressed.*

Driveway Design

In reviewing the history of this development proposal, VHB reviewed a number of resident and town staff concerns about the project's traffic impacts and the roadway design. In this document, VHB has acknowledged that the traffic information provided is generally accurate. That said, VHB has asked for additional clarification/information relating to the location of the site driveway as well as the sight distances offered by that placement.

Ultimately, this roadway is subject to oversight and authority of the Massachusetts Department of Transportation (MassDOT) as they control the roadway layout. As the project requires a Highway Access Permit and it is projected to generate 1,000 or more daily trips, it will also be subject to the Massachusetts Environmental Policy Act regulations (MEPA). During this phase of the design/development, MassDOT will ultimately determine if the need for additional sight lines are necessary.

To that end, it should be noted that the applicant has provided VHB with additional information regarding sight lines and driveway design. This information is attached to this document and shows an expanded survey limit along Great road and identifies how and where the sight lines for drivers approaching the site drive dip below the view of drivers waiting to exit the driveway (Figure A-1 / Sight Distance Profiles). The sight lines that will be provided at the driveway meet the recommended minimum distances for drivers exiting the project driveway, but do not meet the desirable distances. Earlier in this letter, VHB has asked that the applicant provide information about the limitation and how they may or may not be improved.

Please call if you have any questions or require additional information. Representatives from VHB will be available at the next Zoning Board of Appeals hearing to discuss in greater detail these findings if needed. The applicant should be prepared to address as many of these comments as reasonably possible at the upcoming Zoning Board of Appeals hearing and incorporate them into revised traffic plan based on the outcome of the meeting.

Very truly yours,

VANASSE HANGEN BRUSTLIN, INC.

Robert L. Nagi, P.E.
Principal – Transportation Systems

CC: Edward Marchant, EHM
Kenneth Cram, Bayside Engineering

(30)

Michelle Cobleigh

From: Nagi, Robert [RNagi@VHB.com]
Sent: Friday, February 03, 2012 3:41 PM
To: Sherrill Gould; emarchant@msn.com; Michelle Cobleigh
Cc: Cheryl Cowley Hollinger
Subject: 15 Great Road :: MassDOT Meeting

Here is a quick report on the meeting that I attended on Tuesday January 31st between the Applicant for 15 Great Road and MassDOT.

David Hale and Ken Cram from the applicants team attended. I attended on behalf of the Town.

It was a relatively quick meeting where the applicant re-introduced the plan to MassDOT and provided an update on the project for everyone.

I should point out that, despite the acquisition of the additional properties on the site, it appears that the applicant isn't likely to relocate the driveway after all. This is due to the presence of some wetlands where the applicant was thinking of shifting the driveway towards. I have asked the applicant to document the wetlands on their next submission so it's clear where these constraints are to everyone. I also asked that they provide a clear explanation as to why this isn't a viable option anymore.

During the conversation, I mentioned to MassDOT that the town is concerned about the sight distance and how the speed measurements were obtained. MassDOT offered to send a crew out to the intersection and conduct a scientific speed study at the driveway location and provide the resulting data to the Town and to the applicant so that everyone can be assured of the actual design speeds. They hoped to have this study conducted within a couple weeks, and definitely prior to the next scheduled ZBA meeting.

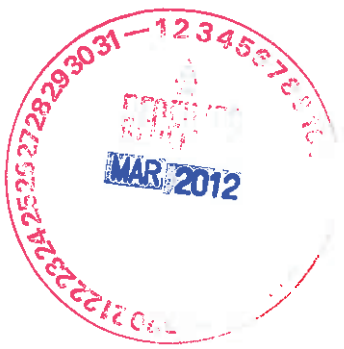
MassDOT was clear with the applicant that, at a minimum, they will require the driveway location to meet the Stopping Sight Distance for the POSTED speed limit as opposed to the 85th percentile speed along Great Road ~ if less. I should note that the posted speed limit is 50 mph in the immediate vicinity of the project site as opposed to the 85th percentile speed of 43 and 48 mph. This will likely require the applicant to make some modifications to their plan to address this requirement.

Other than that, MassDOT reserved comment on the site plan and other elements of the study until it was presented to them formally as part of the MEPA process.

Hope this helps. If I get the speed information from MassDOT at some point in the near future, I will forward to the ZBA team on this distribution list.

Robert L. Nagi, P.E.
Principal - Transportation Planning & Operations
VHB | Vanasse Hangen Brustlin, Inc.
Transportation | Land Development | Environmental Services
101 Walnut Street
Watertown, MA 02472
Phone: 617.924.1770 x1443 | Fax: 617.924.2286
Direct: 617.607.2731 | Mobile: 508.259.3031
rnagi@vhb.com
www.vhb.com

BAYSIDE ENGINEERING



February 28, 2012

Ms. Sherrill R. Gould, Chair
Littleton Appeals Board
Town of Littleton
Shattuck Street
Municipal Building, Room 303
Littleton, MA 01460

Re: ***Proposed Comprehensive Permit (40B) Development***
15 Great Road, Littleton, MA

Dear Ms. Gould:

Bayside Engineering is in receipt of VHB's January 11, 2012 peer review letter relative to the proposed apartment development to be located at 15 Great Road in Littleton, MA. Bayside has prepared this response to comments letter to address the comments raised in the VHB review. VHB's comments are italicized below, along with our responses.

Technical Issue #1: Driveway Sight Distance

VHB has asked the applicant to provide additional information relative to the placement of the driveway and sight lines which should formally be submitted for review through the Board. VHB has asked the design engineer to provide additional information and perform additional calculations based on the following considerations:

- *Recognizing that the ideal location for the driveway is at the crest of the vertical curve, can the driveway be shifted to the east slightly? If so, how far? If not, what are the physical (structures?) or regulatory (wetland impacts?) limitations to shifting it in this direction? Furthermore, have feasible solutions to these 'limitations' been considered?*

- *Assuming that the driveway cannot be shifted to the east, what other actions (advanced signage, removing line-of-sight obstructions, re-grading, etc...) might improve the sight lines and/or warn approaching drivers of the intersection location?*

Response: Places Associates, the site civil engineer, has designed the current proposed site driveway to be as far east as possible without requiring the filling of any wetlands. Alternate driveway locations were also reviewed. Alternative No. 1 looked at a driveway location east of the current proposed driveway location which would have placed the driveway at the crest of the vertical curve on Great Road. However, this location was dismissed as it requires the filling of wetlands.

Alternative No. 2 looked at a driveway location west of the current proposed driveway location. The project proponent acquired the properties west of the site to Grist Mill Road. A new driveway could be constructed within this area which would provide additional sight distance. However, this alternative was rejected for qualitative, cost and technical reasons:

1) Although this new location would provide longer stopping sight distances (SSD) and intersection sight distances (ISD), the higher 85th percentile speed of passing cars at this location also increased the minimum sight distance requirements making the increased sight line benefit marginal when compared to the proposed driveway location.

2) Qualitatively, the proposed driveway location affords longer ISD to the west and longer SSD for eastbound vehicles than Alterative No. 2.

3) The proposed driveway location also affords vehicles exiting the site views of the traffic signal to the east and 300 feet beyond. As the SSD at this location meets the minimum SSD requirement based upon the AASHTO standard of the 85th percentile speed (which has a margin of safety built in), the benefit of lower speeds at the proposed driveway location, combined with a view of vehicles stopped at the traffic signal, as well as sight lines extending 300 feet beyond the traffic signal, it is our opinion this location outweighs any benefits offered by the Alternative 2 location.

4) For the Alternative No. 2 location, the recommended exclusive left-turn lane would start west of the Grist Mill Road intersection which might cause a perception of additional traffic issues.

5) Alterative No. 2 would also require extensive road widening to the west which would involve extensive fill, the moving of approximately 200 feet of guard rail and the relocation of three light poles.

In addition, if during the highway access permitting process, MassDOT determines a standard other than the AASHTO standard should be used which results in longer ISD and SSD requirements, the geometry of the proposed driveway location can be changed to provide ISD and SDD that are superior to those available at Alterative No. 2.

The project proponent has agreed to maintain clear sight lines along the site frontage, as well as minor re-grading of the site frontage, within the Great Road right-of-way to maximize intersection sight distance. Further, the project proponent will relocate existing signs that are located within the right-of-way

that would also affect sight distances such that the signs fall outside the limits of the sight distance triangle. Additionally, with the approval of the Massachusetts Department of Transportation (MassDOT) Highway Division, the project proponent will install Intersection Ahead signs to alert motorists on Great Road of the upcoming driveway intersection.

Technical Issue #2: Emergency Vehicle Access and Circulation

Based on our review, no information has been provided showing if emergency response vehicles can successfully negotiate the current site plan. Additionally, both the Fire and Police departments have commented that accessibility to certain buildings is a concern. With this in mind, the applicant should provide a site plan showing how emergency vehicles will travel through the site. This plan should show not only access to the various buildings, but also should show the vehicles path through the project site as they arrive and depart from each of the buildings within the site. The analysis should be conducted using the commercially available program AutoTurn© (or similar) which is based on actual measurements of the emergency vehicle apparatus that would likely respond to an event at this facility. The plan should demonstrate that no physical limitations exist for the circulation of these vehicles throughout the site.

Response: Places Associates is developing the site plans for the project and this comment will be addressed with the revised plans.

Technical Issue #3: MassDOT Coordination

As noted previously, the project will need to be reviewed and approved by MassDOT as part of their highway access permit process. The applicant has indicated that they have had preliminary discussions with MassDOT relative to the modifications proposed at the site driveway. The applicant should provide an update to the Town on the status of this review and any additional comments that MassDOT may raise as part of that process.

Response: Preliminary discussions have occurred with representatives of the MassDOT District 3 Office in Worcester. These discussions related to the modifications proposed at the site driveway. The applicant plans to file a Highway Access Permit Application and Plan with MassDOT. The project team met with MassDOT initially on October 27, 2011 to present the project.

A second meeting occurred on January 31, 2012 which included the Town's peer review consultant from VHB, Rob Nagi. At this meeting, a summary of the project was provided, along with a discussion about site access and the pros and con's associated with each access alternative relative to sight distances. MassDOT indicated that at a minimum, they would like the SSD criteria met for

the posted speed limit, recognizing that speeds may actually be lower than the posted speed limit. MassDOT further indicated that they would be performing their own independent assessment and would share their findings when compete.

Recent discussions with MassDOT indicate that they completed their informal speed observations and have indicated that the data provided in the TIAS is consistent with their observations. The project proponent has not seen the additional data, but has looked at the Great Road profile and with some re-grading of the roadway, can provide a sight distance profile that meets the requested MassDOT criteria.

TRAFFIC STUDY COMMENTS

Existing Roadway Characteristics

- *The description of the roadways and intersections within the project's study area is generally consistent with our observations and understanding of the roadway use.*
- *Surrounding land uses descriptions in the vicinity of two intersections are generally comprehensive, but should also include :*
    - *Great Road at Nashoba Road – Land uses in the vicinity of this intersection include retail to the north and the Nagog Pond to the east, in addition to the residential uses noted.*
    - *Great Road at Grist Mill Road (west) – Land uses in the vicinity of this intersection include the Oak Meadow Montessori School to the south, in addition to the residential uses noted.*

Response: Bayside concurs with these two additions.

Baseline Traffic Data

- *Traffic data was collected in May 2011. This is generally a reasonable time period from which to collect data and base future assessments for (schools are open, generally good weather, etc...). The study states that weekday evening peak period turning movement counts (TMCs) were conducted from 4:00-6:00 PM (as is standard industry practice). However, the traffic volume data included in the Appendix material includes TMC data collected from 4:30-6:30 PM for the evening peak period. This is not a significant issue, but the report should be corrected to reference the correct times of observations.*

Response: Bayside concurs with this statement.

Sight Distance

- *To this extent, VHB has asked the design engineer to provide additional information and perform additional calculations based on the following considerations:*
  - *Recognizing that the ideal location for the driveway is at the crest of the vertical curve, can the driveway be shifted to the east slightly? If so, how far? If not, what are the physical (structures) or regulatory (wetland impact) limitations to shifting it in this direction? Furthermore, have feasible solutions to these 'limitations' been considered?*
  - *Assuming that the driveway cannot be shifted to the east, what other actions (advanced signage, removing line-of-sight obstructions, re-grading, etc...) might improve the sight lines and/or warn approaching drivers of the intersection location?*
- *The applicant notes that a sight line triangle should be provided along the project frontage and that any line-of-sight obstructions should be removed and that future plantings should be limited in height. The Board should consider requesting a sight distance easement be provided from the applicant for any portion of this sight triangle that is on privately owned property.*
- *It also notes an area of regarding adjacent to Great Road should be conducted to assist in extending the sight lines for drivers exiting the project site driveway. This area of regarding should be shown graphically on the site plan.*

Response: Places Associates, the site civil engineer, has designed the site driveway to be as far east as possible without requiring the filling of any wetlands. Alternate driveway locations were also reviewed. Alternative No. 1 looked at a driveway location east of the current proposed driveway location which would have placed the driveway at the crest of the vertical curve on Great Road. However, this location was dismissed as it requires the filling of wetlands.

Alternative No. 2 looked at a driveway location west of the current proposed driveway location. The project proponent acquired the properties west of the site to Grist Mill Road. A new driveway could be constructed within this area which would provide additional sight distance. However, this alternative was rejected for a number of qualitative, cost and technical reasons:

1) Although this location provided longer stopping sight distances (SSD) and intersection sight distances (ISD), the higher 85th percentile speed of passing cars at this location also increased the minimum sight distance requirements

making the increased sight line benefit marginal when compared to the proposed location.

2) Qualitatively, Alternative No. 1 affords longer ISD to the west and longer SSD for eastbound vehicles than Alterative No. 2.

3) The proposed driveway location also affords vehicles exiting the site views of the traffic signal to the east and 300 feet beyond. As the SSD at this location meets the minimum SSD requirement based upon the AASHTO standard of the 85th percentile speed (which has a margin of safety built in), the benefit of lower speeds at the proposed driveway location, combined with a view of vehicles stopped at the traffic signal, as well as sight lines extending 300 feet beyond the traffic signal, it is our opinion this location outweighs any benefits offered by the Alternative 2 location.

4) For the Alternative No. 2 location, the recommended exclusive left-turn lane would start west of the Grist Mill Road intersection which might cause a perception of additional traffic issues.

5) Alterative No. 2 would also require extensive road widening to the west which would involve extensive fill, the moving of approximately 200 feet of guard rail and the relocation of three light poles.

In addition, if during the highway access permitting process, MassDOT determines a standard other than the AASHTO standard should be used which results in longer ISD and SSD requirements, the geometry of the proposed driveway location can be changed to provide ISD and SDD that are superior to those available at Alterative No. 2.

The project proponent has agreed to maintain clear sight lines along the site frontage, as well as minor re-grading of the site frontage, within the Great Road right-of-way to maximize intersection sight distance. Further, the project proponent will relocate existing signs that are located within the right-of-way that would also affect sight distances such that the signs fall outside the limits of the sight distance triangle. Additionally, with the approval of the Massachusetts Department of Transportation (MassDOT) Highway Division, the project proponent will install Intersection Ahead signs to alert motorists on Great Road of the upcoming driveway intersection.

Intersection Operations

- *VHB has evaluated the analysis provided within the report and finds that it was prepared to industry standards and is a valid representation of the actual in-field conditions and likely projections of future traffic conditions.*

- *According to Table 10, the study has identified that there are several movements that will be directly impacted by this proposal within the study area. These include:*

  - *Great Road at Grist Mill Road (west) southbound left-turn/right-turn: Weekday Evening Peak Hour. This approach will degrade from LOS D under 2016 No-Build conditions to LOS E under 2016 Build conditions with the introduction of additional through traffic volumes along Great Road.*

  - *Great Road at proposed site drive southbound left-turn/right-turn: Weekday Morning and Weekday Evening Peak Hours. This approach is projected to operate at LOS E during the weekday morning peak hour and LOS F during the weekday evening peak hour under 2016 Build conditions.*

Response: The analytical methodologies used for the analysis of unsignalized intersections use conservative analysis parameters, such as high critical gaps. The critical gap is defined as the minimum time between successive main line vehicles for a side street vehicle to execute the appropriate turning maneuver. Actual field observations indicate that drivers on minor streets accept smaller gaps in traffic than those used in the analysis procedures and therefore experience less delay than calculated by the HCM methodology. The analysis results overstate the actual delays experienced in the field. It should be noted that the unsignalized intersections along heavily trafficked roadways operate at constrained levels and the resulting calculated results of the unsignalized intersection analyses should be considered highly conservative.

Great Road at Site Driveway Recommendations

- *The study notes that traffic volumes generated by the project are not high enough to warrant signalization of the site driveway. While that appears to be a supportable statement, no documentation is provided to verify this statement. The applicant should provide a basic 'peak hour' traffic signal warrant for the site driveway confirming that signalization is not a supportable/warranted option for addressing the operations at this location.*

Response: A peak hour warrant analysis was performed and is attached. Based on the analysis, signalization of the site driveway is not warranted.

- *On page 28, the study notes: "Additional analyses were performed assuming the intersection were to be signalized. These analyses indicate that the intersection would operate at LOS A during both the weekday morning and evening peak hours. This significant improvement in operating conditions indicates that the projected unsignalized analyses will not be as poor as the capacity analysis model indicates." It is unclear how and why this conclusion was reached as it is not standard industry practice to make the comparison as the study suggests.*

Response: This testing methodology conclusion has been based on nearly 30 years of experience in the preparation of traffic impact studies and in my opinion provides a qualitative sense of the intersection's operation. Simply put, if an unsignalized intersection is projected to operate poorly, this engineer's experience has been to "test" the intersection for potential mitigation by initially analyzing as a signalized intersection using existing geometry. With the improvement to a good level of service, it has been made clear that existing unsignalized operations will not be as poor as the capacity analysis methodology predicts. Further, when actual delays have been measured at unsignalized locations, the actual delays are significantly lower than those reported using the Highway Capacity Manual (HCM) methodologies for unsignalized intersections.

- *That said, it should be noted that it is not uncommon for the highway capacity software to overstate the level of delay for the minor approach to unsignalized intersections.*

- *The study recommends widening Great Road to provide a left-turn lane into the site. The applicant should provide technical justification for providing a left-turn lane into the project site driveway as well as an analysis of how the left-turn might improve intersection operations.*

Response: A left-turn lane warrants analysis was performed and is attached indicating a left-turn lane is warranted.

- *Lastly, the study recommends maintaining a sight distance triangle along the site frontage. VHB supports this recommendation as it is a requirement of providing safe and efficient access. See comment previously in the Sight Distance discussion about the sight triangle.*

Response: Bayside concurs with this statement.

Comments on the Site Plan

In reviewing the site plan from an on-site circulation perspective, VHB offers the following comments (note that specific issues relating to site plan review are not directly covered as part of this effort):

- *A waiver was requested to permit parking supply of less than the zoning requirement of two (2) spaces per dwelling unit. The site plan appears to offer 334 parking spaces (including 14 accessible parking spaces). This is 49 spaces less than the proposed parking supply highlighted in the traffic study of 383 parking spaces. The applicant should confirm the number of parking spaces to be provided.*

Response: Places Associates is developing the site plans for the project and this comment will be addressed with the revised plans.

- *A circulation diagram demonstrating that access for emergency vehicles can easily maneuver through the site was not provided. It is important for safety reasons that the applicant provide a drawing which clearly shows the routes and pathways that an emergency response vehicle would need to travel through the site. The applicant should provide a detailed plan showing how an emergency vehicle would enter the project site, travel through it to each of the buildings located within the development, and exit the site. The plan should demonstrate that there are no areas where emergency vehicle response would be impeded by physical obstructions.*

Response: Places Associates is developing the site plans for the project and this comment will be addressed with the revised plans.)

- *A comment letter from the Littleton Police Department dated September 7, 2011 notes under comment 4 "No emergency vehicle access to the rear of buildings #1, #5, and #6." The police department letter goes on to suggest investigation of a roadway connection to the rear of buildings #5 and #6 to facilitate emergency vehicle access. The applicant should demonstrate how this comment has been addressed.*

Response: Places Associates is developing the site plans for the project and this comment will be addressed with the revised plans.

- *In a letter dated April 19, 2011, the Littleton Fire Department also notes that turning radius diagrams were not provided and that they have concerns about accessibility to only one side of the buildings. The applicant should demonstrate how this comment has been addressed.*

Response: Places Associates is developing the site plans for the project and this comment will be addressed with the revised plans.

Please call if you have any questions or require additional information.

Sincerely,

BAYSIDE ENGINEERING

Kenneth P. Cram, P.E.
Director, Traffic Engineering

cc: D. Hale, Omni Properties
R. Nagi, VHB