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September 6, 2017

Mr. Adam Duchesneau, AICP
Town Planner
Town of Boxborough
29 Middle Road
Boxborough, MA 01719

Subject: Traffic Engineering Peer Review
700, 750, and 800 Massachusetts Avenue

Dear Mr. Duchesneau:

Green International Associates, Inc. (Green) has reviewed supplemental and revised documents for the Application for Site Plan Approval for the proposed “Enclave at Boxborough” at 700-800 Massachusetts Avenue. This letter serves as a follow-up to our initial review letter, dated April 28, 2017, and is being provided to update Green’s findings, comments, and recommendations. Our review is based on the latest plans and correspondence provided by the Applicant, and includes the following:

- Response to Engineering Peer Review for Traffic Access, provided by Bayside Engineering, Inc., dated June 23, 2017
- Site Plan for “Enclave at Boxborough”, 700-800 Massachusetts Avenue, Boxborough, Massachusetts prepared by Stamski and McNary, Inc., revised August 30, 2017
- Fire Truck Turning Plan, prepared by Stamski and McNary, Inc., dated August 30, 2017
- Response to comments letter from Stamski and McNary, Inc., dated September 1, 2017

For ease of reference, all of our previous comments and the applicant’s responses have been repeated here, and Green has provided comments on the status of each original comment.

Comment 1:

The TIAS included the following five study intersections:

- Massachusetts Avenue at Stow Road/Middle Road
- Massachusetts Avenue at Burroughs Road/Hill Street
- Stow Road at Sheriff’s Meadow Driveway
- Stow Road at Burroughs Road
- Burroughs Road at Priests Lane

The study area and intersections included in the TIAS are reasonable for a development project of this size based on the amount of traffic expected to be generated by the development project, and is consistent with current MassDOT guidelines.

Applicant Response (Bayside Engineering, June 23, 2017):

Bayside concurs with this statement.

Green Response:

Comment resolved.

Comment 2:

Traffic count data were collected on weekdays from February 23-25, 2016 during appropriate time periods. The February data was increased by 7% to adjust for seasonal variation based on four MassDOT count stations located in Marlborough. While this is a reasonable methodology, we note that the monthly traffic volume data used to determine the seasonal adjustment is from the years 2005-2009 and reflects travel patterns during the recession. MassDOT provides more recent continuous count station data on their website. We noted that monthly traffic data are provided on Route 2 in Acton for the year 2016, and recommend that the applicant review the latest traffic volume data available to verify that a 7% seasonal adjustment factor is appropriate.

Applicant Response (Bayside Engineering, June 23, 2017):

Bayside reviewed the traffic count data from the permanent count station located on Route 2 in Boxborough for 2016. This data correlated with the 7% seasonal adjustment. A summary of the count data is included in the Appendix.

Green Response:

Green notes that the Count Station used is actually in Acton as there is no MassDOT Count Station on Route 2 in Boxborough. The Count Station on Route 2 in Acton is appropriate to use and based on that data, February traffic volumes are 7% below the annual average. Therefore, the 7% upward adjustment to traffic volumes is appropriate. **Comment resolved.**

Comment 3:

Crash data at the study intersections were presented from information provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the five-year period, 2009-2013. Green notes that MassDOT released their 2014 crash data in July 2016, prior to the submission of the TIAS. We note that there was one crash at the Massachusetts Avenue/Stow Road/Middle Road intersection in 2014, two crashes at the Massachusetts Avenue/Burroughs Road/Hill Street intersection in 2014, and one crash at the Stow Road/Burroughs Road intersection in 2014. While the 2014 crash data indicates a small number of reported crashes, it would be useful to update Table 2 by adding in 2014 and deleting 2009 data.

Applicant Response (Bayside Engineering, June 23, 2017):

Table 2 has been updated to represent the crash data from 2010 through 2014. At the time of the preparation of the TIAS, MassDOT 2014 crash data was not available. Table 2R on the following page represents the updated crash information.

Green Response:

The Applicant has reviewed the 2014 crash data at the study intersections and shown that all of them continue to have crash rates below the MassDOT District average. **Comment resolved.**

Comment 4:

Future traffic volumes were projected seven years to the year 2023, consistent with MassDOT's TIA Guidelines. The future traffic volume projections included traffic from two other specific development projects noted in the Appendix (593 Massachusetts Avenue and Jefferson at Beaver Brook). Based on historical count data from the MassDOT, an annual background growth rate of 1% was also applied to the existing traffic volumes to develop the future volume forecasts. We concur with this methodology for future traffic volume projections.

Applicant Response (Bayside Engineering, June 23, 2017):

Bayside concurs with this statement.

Green Response:
Comment resolved.

Comment 5:

The ITE Land Use Code 230 – Residential Condominium/Townhouse was used in the trip generation calculations. We note that the ITE Land Use Code 251 – Elderly Housing – Detached also could have been used since the proposed residences are age-restricted, but using Land Use Code 230 is acceptable and likely provides a conservative estimate of actual traffic conditions.

Applicant Response (Bayside Engineering, June 23, 2017):

Bayside concurs with this statement.

Green Response:
Comment resolved.

Comment 6:

The TIAS used a trip distribution of 65% of project trips to and from the west and 35% to and from the east. Traffic to and from the east was then split further to and from the north and south at the Massachusetts Avenue / Stow Road / Middle Road intersection. The existing traffic patterns documented in the ATR and TMC data indicate that the trip distribution is closer to a 50/50 split between traffic to/from the east and the west including during the weekday peak commuting hours. This measured split is likely because Boston is a major destination to the east via Massachusetts Avenue and Route 2, while I-495 and the towns and cities along its length are significant traffic generators to the west.

However, it is noted that revising the trip distribution to a 50/50 split would only add nine (bidirectional) vehicle trips during each peak hour at the Massachusetts Avenue/Stow Road/Middle Road intersection and subtract nine (bidirectional) vehicle trips during each peak hour from the Massachusetts Avenue/Hill Road/Burroughs Road intersection. This change is unlikely to change any conclusions or recommendations reached in the TIAS.

Applicant Response (Bayside Engineering, June 23, 2017):

Bayside concurs with this statement.

Green Response:
Comment resolved.

Comment 7:

In the intersection capacity analysis (Synchro) worksheets, all of the pages (including for the No-Build and Build analyses) were labeled “Existing” and none of the pages specified the peak hour (AM or PM) corresponding to the analysis. This makes it difficult to verify that the analysis results shown in Table 9 are correct. Furthermore, we suggest that all STOP-controlled movements be included in Table 9 (not just the movements from one side street approach) to facilitate a comparison of how these movements operate under Existing, No Build, and Build conditions.

Applicant Response (Bayside Engineering, June 23, 2017):

In the Appendix to this letter are the capacity analysis worksheets with the labels corrected. Summarized in Table 9R are all the STOP-controlled movements.

Green Response:

The Applicant has provided clearly labeled intersection capacity analysis worksheets and has summarized analysis results for all of the side street approaches. All of the movements at the study intersections operate acceptably during both weekday peak hours, and are expected to continue to do so under future conditions.

Comment resolved.

Comment 8:

There is a typographical error in the Synchro analysis for the eastbound right turn at the Massachusetts Avenue at Stow Road/Middle Road intersection under No-Build weekday afternoon peak hour conditions. The 18 right turning vehicles should be 28 right turning vehicles to be consistent with Figure 5. However, this would not have any significant effects on the results of the analysis as right turns are generally not a critical movement at unsignalized intersections.

Applicant Response (Bayside Engineering, June 23, 2017):

The level of service results presented in Table 9R reflects this correction.

Green Response:

The applicant has corrected this error in the analysis, which resulted in only minor changes to the analysis findings. **Comment resolved.**

Comment 9:

In the intersection capacity analysis, different peak hour factors (PHF's) were used for each approach. According to the HCM 6, a single PHF based on peak hour traffic volumes at the entire intersection should be used for intersection capacity analyses. This is because it is unlikely that multiple approaches will experience peak volumes within the same 15-minute interval (within the peak hour). However, the applicant's use of approach PHF's for the analysis is also acceptable and generally results in a conservative analysis and actual operating conditions are likely to be better than stated.

Applicant Response (Bayside Engineering, June 23, 2017):

Bayside concurs with this statement.

Green Response:

Comment resolved.

Comment 10:

Limited sight distance is of significant concern in allowing direct access to Massachusetts Avenue from the development project site at the proposed driveway location. Looking to/from the west, the TIAS notes that the available sight distance is 375 feet. Green verified the available sight distance to/from the west, and we generally concur with the measurement of 375 feet.

However, the TIAS did not consider the roadway grade when calculating minimum and desirable sight distances. Based on Figure 10 in the report, the roadway grade over the 375 feet shown is approximately 4 percent. For vehicles approaching from the west, this would increase the minimum required SSD at the 46 mph 85th percentile speed to 398 feet. Therefore, when roadway grade is taken into consideration, the available stopping sight distance looking from the west does not meet the minimum distance for vehicles traveling at the 85th percentile speed. Similarly, the desirable ISD looking to the west from the site driveway is 560 feet when considering the roadway grade. The applicant should evaluate the scope of the regrading work necessary to achieve acceptable ISD and SSD. The applicant should also confirm that it is not feasible to relocate the site drive intersection with Massachusetts Avenue to the east to improve sight distances

looking toward and approaching from the west. Relocating the access point to the west is not advisable due to sight distance restrictions created by the horizontal and vertical curvature in that direction.

Applicant Response (Bayside Engineering, June 23, 2017):

The Applicant met with MassDOT District 3 office on Thursday June 8, 2017 to review the project. Based on the data provided, the stopping sight distance provided is the maximum and is adequate for the posted speed limit of 40 miles per hour (mph). The Applicant has shifted the driveway slightly to the east and maintains the sight distance as presented in the traffic study (375 feet). Due to existing wetlands east of the site driveway, the driveway cannot be shifted further to the east.

Bayside is suggesting a "Hill Blocks View" sign (W7-6) with an advisory Speed Plaque (W13-1P – 40 mph). The sign should be placed about two-thirds of the way down the hill on Massachusetts Avenue (in the vicinity of Hughes Lane). The final signage type and location is to be reviewed and approved by MassDOT prior to installation.

Green Response:

Green concurs that the available sight distance is sufficient for vehicles traveling at the posted speed limit (though not at the measured 85th percentile speed), and therefore it is appropriate to enhance the signing in this area of Massachusetts Avenue in an effort to reduce travel speeds and improve compliance with the posted speed limit. It is also noted that advisory speed plaques are generally not used for the same speed as the posted regulatory speed limit on the roadway. The Applicant should continue to work collaboratively with MassDOT to develop an effective signing plan for this area. **Comment resolved.**

Comment 11:

Green also verified the available sight distance at the proposed site driveway looking to/from the east. We note that the measured 375 feet of available sight distance documented in the TIAS is an estimate based on the anticipated future conditions, with the proposed regrading of a portion of the berm along the south side of Massachusetts Avenue.

While Figure 9 of the Traffic Impact and Access Study is drawn correctly to show SSD for vehicles approaching from the east, the minimum required ISD for drivers exiting the development project site driveway looking to the east must be provided as well. The minimum required ISD is the same as the minimum required SSD. An exiting driver's eyes are assumed to be positioned approximately 15 feet back from the edge of the traveled way and therefore, the sightline shown in Figure 9 needs to start at a point approximately 15 feet back from the edge of the traveled way at the proposed site driveway location. This may increase the area on-site that will need to be regraded and maintained for sight distance.

Applicant Response (Bayside Engineering, June 23, 2017):

Figure 9 of the traffic study shows the stopping sight distance (SSD), not the intersection sight distance (ISD). Bayside concurs that the ISD is typically measured at a point approximately 15 feet back from the edge of the traveled way at the proposed site driveway location. This is a conservative assessment. The Applicant is agreeable to regrading in front of the site along Massachusetts Avenue to provide the maximum ISD feasible.

Green Response:

The Site Plans revised August 30, 2017 define an area to the east of the proposed site driveway to be graded and cleared. The area shown on the plan is more than sufficient to provide adequate ISD for vehicles exiting the site driveway looking to the east. **Comment resolved.**

Comment 12:

Related to the crash analysis and sight distance concerns in the proximity of the proposed site drive, it is recommended that the applicant evaluate crashes that occurred along a section of Massachusetts Avenue near the proposed site driveway location to determine if the proposed site driveway location would exacerbate any existing safety concerns. According to MassDOT's Crash Data Portal, several crashes occurred within 700 feet of the proposed site driveway location during the study period. The applicant should review recent crash reports near the proposed site driveway location, preferably from the local police department.

Applicant Response (Bayside Engineering, June 23, 2017):

Bayside reviewed the crash data from MassDOT's Crash Portal and found that along the stretch of Massachusetts Avenue from Stow Road to Hughes Lane, there were four (4) crashes over the five (5) year period of 2010 to 2014. All were single vehicle crashes (one involved a motorist hitting a parked car) and no injuries were reported. Based on a review of the available data, speed was not found to be a factor in the crashes. Local crash data from the Boxborough Police Department has been requested.

Green Response:

Green concurs that there were four (4) crashes (all single-vehicle and property-damage-only) along the segment of Massachusetts Avenue between Stow Road and Hughes Lane during the years 2010-2014. It is noted that the MassDOT crash data alone do not provide enough information to determine whether speed was a factor in the crashes that have occurred, and that local police data would be required to reach this conclusion. However, as noted in Comment #10, above, the Applicant has committed to providing additional signage in an effort to reduce travel speeds on Massachusetts Avenue (pending MassDOT review and approval). **Comment resolved.**

Comment 13:

The applicant has committed to constructing a sidewalk along the south side of Massachusetts Avenue between the Site Drive and the intersection with Stow Road/Middle Road to provide a pedestrian connection to existing sidewalks at that intersection.

Green recommends that the following additional pedestrian improvements be implemented to complete the pedestrian connections:

- Reconstruct the curb ramps on the southwest, southeast, and northeast corners of the intersection at the intersection of Massachusetts Avenue / Stow Road / Middle Road to be ADA-compliant.
- Restripe the marked crosswalk across the east leg of Massachusetts Avenue at the intersection with Stow Road and stripe a crosswalk across Stow Road to provide high-visibility ladder-style markings.
- Provide pedestrian crossing warning signage at the marked crosswalk across the east leg of the intersection facing each direction of Massachusetts Avenue traffic.

It is also recommended that the applicant remove the existing pedestrian crossing warning sign assembly currently located approximately 90 feet west of the Massachusetts Avenue/Stow Road/Middle Road intersection since there is no marked crosswalk at that location. All of the pedestrian improvements within the Massachusetts Avenue layout will require MassDOT approval, as the roadway is under state jurisdiction.

Applicant Response (Stamski and McNary, September 1, 2017):

Labels have been added to Site Development Plan (Sheet 10) stating that ramps will be reconstructed, crosswalks will be striped, that pedestrian warning signage will be provided, and that existing signage will

be removed or replaced in association with ramps and crosswalks. All of these actions are subject to MassDOT review and approval following the completion of MEPA process.

Green Response:

The Applicant has agreed to implement all of the suggested additional pedestrian mitigation measures, pending MassDOT approval. **Comment resolved.**

Comment 14:

The applicant should provide vehicle turning paths to demonstrate that emergency vehicles (and other large vehicles) can safely and efficiently access the site and maneuver within the project site.

Applicant Response (Stamski and McNary, September 1, 2017):

Our office has prepared a Fire Truck Turning Plan (2 sheets), dated August 30, 2017, which illustrates the travel path of a local custom fire ladder truck throughout the site and along the proposed emergency access driveways to Stow Road and Priest Lane.

Green Response:

The Fire Truck Turning Plans demonstrate that a 38.5 ft long ladder fire truck can adequately maneuver within the project site, at the primary driveway, and at the proposed emergency access points. We understand that the Applicant has been coordinating with Town of Boxborough public safety officials and Green does not have concerns regarding the adequacy of the proposed design with respect to emergency access. However, the Fire Truck Turning Plan notes that the turning template and ladder truck template were provided by the Town of Sudbury. It is likely that the fire trucks used by the Town of Boxborough are similar in size to those used in Sudbury, but the Applicant should confirm the size of the fire trucks with the Town of Boxborough Fire Department.

Comment 15:

In addition to the primary site driveway, two emergency access roads are proposed to connect to Stow Road and Priest Lane. It is appropriate to provide multiple access points to a project of this size. The applicant should coordinate with the Town's public safety officials to ensure that the proposed emergency access roads are sufficient and satisfies any concerns raised by the Fire Chief.

Applicant Response (Stamski and McNary, September 1, 2017):

The emergency access drive to Stow Road has been flared out near Drive B sidewalk to provide additional comfort level for fire truck turning left or right. The current Site Plan reflects adjustments previously discussed with the Fire Chief. Pavement width was minimized accordingly and reduced curb heights provided with signage at each emergency curb-cut along Drive 'B' and Drive 'C'. The Fire Chief has been requested to provide a written review of the Site Plan.

Green Response:

Green understands that the Applicant has been coordinating with the Fire Chief, and has made revisions to the proposed site plan to enhance emergency access, as described above. A written response from the Fire Chief would be helpful to document that the Boxborough Fire Department is satisfied with the proposed access to the site.

Comment 16:

Each unit is provided with a two-car garage, which meets Town Zoning Bylaw requirements. However, only 36 parking spaces are proposed at the clubhouse. This is not consistent with Town Zoning Bylaws Section 6006, which states that the minimum off-street parking ratio for clubs, lodges, and association buildings is

one space per two memberships, which in this case would be 50 parking spaces for this site. We recommend that the applicant either revise the site plan or provide justification for the reduced parking supply.

Applicant Response (Stamski and McNary, September 1, 2017):

Fourteen “future” parking spaces are designated along Drive ‘A’ near clubhouse to satisfy fifty-space requirement per Zoning Bylaw.

Green Response:

The proposed 14 “future” parking spaces are reasonable, should the parking demand at the proposed clubhouse exceed the proposed 36 parking spaces. These 14 “future” parking spaces should be constructed if deemed necessary by the zoning enforcement officer or public safety officials. **Comment resolved.**

Comment 17:

At the clubhouse parking lot, the aisle circulation width and all parking space dimensions meet or exceed Town zoning requirements and typical industry practice. The applicant has also provided an appropriate number of accessible parking spaces.

Applicant Response (Stamski and McNary, September 1, 2017):

We concur with this statement.

Green Response:

Comment resolved.

Comment 18:

The 24-foot-wide internal drives are consistent with Town Zoning Bylaw requirements.

Applicant Response (Stamski and McNary, September 1, 2017):

We concur with this statement.

Green Response:

Comment resolved.

Comment 19:

With the internal roadway width of 24 feet, it is recommended that on-street parking be prohibited within the proposed development project at minimum on one side. Curbside parking along the internal roadways could inhibit or impact the flow of emergency vehicles as well as other movements. Areas of restricted on-street parking should be identified on the site plans. In addition to restricting on-street parking, the applicant could explore providing small areas of “visitor parking” scattered at strategic locations within the development. We recommend that the applicant install signs to communicate the parking restriction to residents and visitors of the site.

Applicant Response (Stamski and McNary, September 1, 2017):

Two off-street visitor parking spaces per unit are provided at each garage door to address this concern as opposed to smaller remote visitor spaces. Please review recommended guidance to be implemented by Toll into the condominium rules and regulations for parking along the private ways within the development. Appropriate signage restricting parking can be provided following construction if deemed necessary by the zoning enforcement officer or public safety officials.

Green Response:

The proposed accommodations for visitor parking at each unit is reasonable, as is additional signage restricting parking if deemed necessary by the zoning enforcement officer or public safety officials.

Comment resolved.

Comment 20:

We recommend that the Applicant provide bicycle parking adjacent to the clubhouse to encourage multimodality.

Applicant Response (Stamski and McNary, September 1, 2017):

Five bicycle spaces have been provided at clubhouse near mail center (Sheet 5).

Green Response:

Comment resolved.

Comment 21:

Provide a detailed plan evaluation including plan profiles of the stopping sight distances and the intersection sight distances in relation to the proposed site access drive. The applicant must clearly demonstrate that safety criteria is satisfied and if it requires proposed actions within the road layout or on the proposed development property, the type of work must be clearly defined.

Applicant Response (Stamski and McNary, September 1, 2017):

See Bayside Engineering response Letter dated June 23, 2017.

Green Response:

As noted in Comment #11, above, the Site Plans revised August 30, 2017 define an area to be regraded and cleared to provide clear Intersection Sight Distance (ISD). The area shown on the plan is more than sufficient to provide adequate ISD for vehicles exiting the site driveway. **Comment resolved.**

Comment 22:

Based on the applicant's data and our research, this section of Massachusetts Avenue is characterized by relatively high travel speeds, sight distance constraints and has a crash history (to be further confirmed and evaluated by the Applicant's engineer – see above comment). Actions that could improve the overall safety of this affected section of road and that could potentially become part of the project's mitigation program should be given thought and outlined.

Applicant Response (Stamski and McNary, September 1, 2017):

See Bayside Engineering response Letter dated June 23, 2017.

Green Response:

As discussed in Comment #10, above, the Applicant has discussed the project with MassDOT and has committed to implementing appropriate signage, to be reviewed and approved by MassDOT, in an effort to reduce travel speeds on Massachusetts Avenue and improve safety in the vicinity of the proposed site driveway. **Comment resolved.**

Comment 23:

It is recommended that the applicant confirm that STOP lines and STOP signs are proposed at the following locations as they are shown but not clearly labeled on the plan:

- Facing Private Drive C at the intersection with Private Drive A

- Facing Private Drive A at the intersection with Private Drive B

Applicant Response (Stamski and McNary, September 1, 2017):

Labels on current Site Plan indicate Stop lines and signs at Drive 'A' & Drive 'C'.

Green Response:

Comment resolved.

Comment 24:

At the proposed marked crosswalk across Private Drive A to the southeast of the intersection with Private Drive C, it is recommended that pedestrian crossing warning signage be installed facing each direction of traffic on Private Drive A, and that ADA-compliant curb ramps with detectable warning panels are constructed. It is recommended that a crosswalk be striped across Private Drive A at the intersection with Private Drive B.

Applicant Response (Stamski and McNary, September 1, 2017):

The Layout and Utilities Plan (Sheets 11 & 13) shows Signage and ADA-compliant curb ramps. Crosswalks will also be striped at intersections per MassDOT standards.

Green Response:

Comment resolved.

Comment 25:

The applicant has committed to constructing a sidewalk network on one side of each internal street throughout the development project. It is recommended that a sidewalk be also constructed along the west side of Private Drive A between the clubhouse parking lot and the intersection with Massachusetts Avenue. A marked crosswalk could then be provided across Private Drive A at the intersection with Massachusetts Avenue to connect with the proposed sidewalk along the south side of Massachusetts Avenue easterly to the intersection with Stow Road. This would benefit residents and visitors who may wish to walk from the clubhouse to downtown Boxborough, which is located to the east on Massachusetts Avenue.

Applicant Response (Stamski and McNary, September 1, 2017):

The entrance portion of sidewalk has been moved to the clubhouse side and a marked crosswalk is proposed at entrance.

Green Response:

Comment resolved.

Comment 26:

The applicant should address the parking issues noted in the above comments including providing bicycle parking facilities at the clubhouse.

Applicant Response (Stamski and McNary, September 1, 2017):

Five Bicycle spaces have been provided at clubhouse per Zoning Bylaw.

Green Response:

Comment resolved.

Mr. Adam Duchesneau, AICP
September 6, 2017

Comment 27:

The applicant should confirm with the fire and police chiefs in regards to the manner of design and operations of the emergency access roadway.

Applicant Response (Stamski and McNary, September 1, 2017):

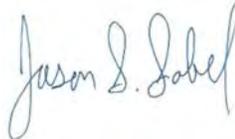
Town Planner has requested written responses from police and fire chief. The Applicant will continue to work with local safety officials.

Green Response:

As discussed in Comment #15 and above, Green understands that the Applicant has been coordinating with the Town of Boxborough public safety officials. Written responses from the police and fire chiefs would be helpful to document that the public safety officials are satisfied with the proposed access to the site.

If you have any questions regarding this review letter or would like to discuss any of the comments in more detail, please do not hesitate to contact me.

Sincerely,
Green International Affiliates, Inc.



Jason S. Sobel, P.E., PTOE
Project Manager

cc: W. Scully, Green International Affiliates, Inc.