



Ms. Elizabeth Hughes
Town Planner
Town of Concord
141 Keyes Road
Concord, Massachusetts 01742

September 6, 2018

Ref. T0813

Re: Transportation Engineering Peer Review
1440 & 1450 Main Street – Concord, Massachusetts

Dear Ms. Hughes:

On behalf of the Town of Concord, TEC, Inc. (TEC) has reviewed documents as part of the transportation engineering peer review of a Site Plan Special Permit application for the proposed 1440 & 1450 Main Street residential development, referred to as "Center & Main," to be located along the northerly side of Main Street in West Concord, Massachusetts. The project consists of constructing 36 single-family homes; of which 34 units will be accessed/egressed by two new one-way driveways along the northerly side of Main Street (Route 62) and of which two (2) units will be accessed/egressed along Highland Street.

The following documents were received as part of our review:

- *Transportation Impact Assessment – Proposed Planned Residential Development – 1450 Main Street – Concord, Massachusetts*; prepared by Vanasse & Associates, Inc.; July 2018;
- *Center & Main – A Planned Residential Development – Concord, Massachusetts (Site Development Plans)*; prepared by Stamski and McNary, Inc.; July 11, 2018;
- *Representative Building Elevations and Floor Plans - Center & Main –Concord, Massachusetts*; prepared by MZO Group; July 2, 2018

TEC completed a review of these documents for the Town of Concord, and the following provides a summary of the comments that we compiled during our review:

Transportation Impact Assessment

- 1.) The Traffic Impact Assessment (TIA) presents a study area extending along Main Street from Conant Street to the west and Church Street to the east. Although operational characteristics of the intersection of Main Street at Highland Street are not projected to be significantly affected by the project, TEC requests that the Applicant provide documentation of the geometrics, sight distance, and traffic safety information for this intersection as it is directly impacted by residential units for the project. TEC does not intend that this comment include acquisition of additional traffic volumes.

- 2.) The intersection of Main Street at Commonwealth Avenue is currently under construction as part of a separate project. The project has the potential to contribute a new level of traffic volume to the intersection; however, as the intersection's reconstruction modifies the intersection layout to allow for Main Street westbound-to-eastbound to operate as the mainline (where Main Street westbound to Commonwealth Avenue previously operated as the mainline), all traffic to/from the project site is expected to be through movements. Therefore, TEC does not find that additional analysis of this intersection is warranted based on the documented trip generation levels. No response required.
- 3.) The TIA reports that June 2018 traffic counts were conducted while public schools were in session. The counts as conducted on June 19th and June 20th occurred following the end of the semester for seniors, following final exams, and during the Q5 period for Concord-Carlisle High School (CCHS), which indicates that traffic volumes in the vicinity may be lower than a typical school session. The Applicant should provide a sensitivity analysis which looks at a spot-traffic count at one of the major study area intersections and provide a comparison to the counts collected on June 19th and June 20th. The Applicant should revise the TIA, if applicable; accounting for any change in traffic volumes, adjusted to all TIA intersections, while school is in full session.
- 4.) The Applicant utilized no seasonal adjustment factor as June volumes in the vicinity are generally above average-month conditions. TEC concurs with this adjustment of traffic volumes. No response required.
- 5.) The Applicant has utilized a conservative travel speed along Main Street of 40 mph to assess operations and safety, including sight distance; which is greater than as measured by the Automatic Traffic Recorders (ATR). TEC concurs with this speed assessment. No response required.
- 6.) The safety analysis indicates the number, type, and severity of crashes at the study area intersections between 2011 and 2015. Upon review of the MassDOT's online crash portal, it appears that some crashes, although limited, may not be represented in the TIA for intersections in the study area. The Applicant should review the crash data for the study area intersections and update as necessary; including the potential to include 2016 data which is currently available from MassDOT. TEC notes that six (6) crashes at the study area intersections are noted for the year 2016. TEC also requests that crash analysis be conducted for the intersection of Main Street at Highland Street as noted in Comment #1.
- 7.) Upon review of the MassDOT's online crash portal and data provided, TEC concurs that there appears to be no identifiable crash issue and/or trend at the study area intersection. Although no specific crash trend exists, the Applicant should provide documentation of other traffic safety related issues/deficiencies at the intersections and subject roadways, if applicable.
- 8.) The Applicant utilized an annual growth adjustment factor of 1.0 percent per year based on stable volume rates reported from 2007 to 2017 as provided by MassDOT. TEC concurs with this adjustment of traffic volumes for annual growth. No response required.

- 9.) The Applicant has estimated the site generated trips based on the Institute of Transportation Engineers (ITE) industry standard publication *Trip Generation, 10th Edition* for Land Use Code (LUC) 210 – Single-Family Detached Housing. Although some housing on-site will consist of “attached” units, the use of LUC 210 provides a conservative assessment of the overall project. The development is anticipated to generate approximately 30 vehicle trips during the weekday morning peak hour and 36 vehicle trips during the weekday evening peak hour. TEC concurs with the methodology and results of the trip generation calculations.
- 10.) The project is in close proximity to the West Concord Massachusetts Bay Transportation Authority (MBTA) Commuter Rail Station. It is reasonable to assume that a percentage of site generated traffic would utilize the commuter rail, rather than personal vehicle travel during commuter hours and other portions of the day. The TIA does not take credit for the potential transit trips and therefore the projection of site generated traffic is conservative. TEC concurs with this trip generation calculation. No response required.
- 11.) In addition to the project being in close proximity to the West Concord MBTA Commuter Rail Station, the project is also within walking/biking distance to the retail and restaurants provided along Main Street and Commonwealth Avenue within West Concord Center. It is reasonable to assume that a percentage of site generated traffic would walk and/or bike, rather than personal vehicle travel during commuter hours and other portions of the day. The TIA does not take credit for the potential walking and biking trips and therefore the projection of site generated traffic is conservative. TEC concurs with this trip generation calculation. No response required.
- 12.) The vehicular traffic generated by the proposed project was distributed onto the adjacent roadway system based upon available Journey-to-Work data published by the US Census Bureau for persons residing in the Town of Concord. This form of trip distribution is consistent with industry standards for residential developments and therefore TEC concurs with the methodology. No response required.
- 13.) The Site Development Plans call for the project’s driveways to be classified as an entry driveway and an egress driveway. This alignment would force all entering vehicles to utilize the one entry driveway and all exiting vehicles to utilize the one egress driveway. The TIA provides a proportional distribution of site generated trips to/from each of the driveways. This distribution should be modified to reflect the condition as shown in the Site Development Plans. This modification will only change operational analysis at the site driveways and will not change the results of the capacity and queue analysis at other study area intersections.
- 14.) There is a discrepancy between the 2018 Existing Traffic Volume Network and the capacity and queue analysis for the southbound right-turn movement from Conant Street to Main Street during the weekday evening peak hour. There are 104 vehicles per the network and 102 per the capacity and queue analysis. This parameter should be corrected.
- 15.) TEC does concur with the *Highway Capacity Manual 2010 (HCM 2010)* methodology as presented in the development of the capacity and queue analysis results. The signalized intersection of Main Street / Pine Street / Church Street was reported however using

- Synchro percentile queue / percentile delay methodology. The Applicant should correct this methodology although TEC agrees that this will have minimal effect on the result of the capacity and queue analysis.
- 16.) The comments as noted above may result in modifications to the results of the capacity and queue analysis and therefore TEC has not provided direct comment on the analysis as presented at this time. TEC reserves the right to provide additional comments upon completion of the peer review comment responses.
 - 17.) Overall, TEC concurs that the general impact of the project on the control delay, queue, and level of service along the approaches to the study area intersections is anticipated to be nominal in terms of 'vehicular' traffic.
 - 18.) As driveways are proposed along Highland Street, the Applicant should provide Intersection Sight Distance (ISD) and Stopping Sight Distance (SSD) information for the intersection with Main Street. The Applicant should provide any sight line mitigation as necessary.
 - 19.) In concurrence with recommendations provided in the TIA, the Applicant should commit to remove and consistently maintain vegetation along the site frontage and at the intersection of Main Street / Highland Street, to ensure sight lines remain unobstructed at the site driveways as noted in the TIA. All new vegetation and site signage should be kept low to not impede sight lines to/from the project driveways and Highland Street. See Comment #36 for specific information regarding sight distance observations.
 - 20.) The Applicant should provide a commitment to implement all transportation related recommendations identified in the TIA. Further discussion of these measures may be documented in the following Site Development Plans comment section.
 - 21.) In addition to recommendations outlined in the TIA, the Applicant should consider upgrades to the accessible ramps and existing crossings at the intersections of Main Street / West Street and Main Street / Highland Street. These crossings will provide a direct path of travel for children of future residents to access the Thoreau Elementary School and provide the path of travel for residents to safely access the MBTA Commuter Rail Station and business district of West Concord; further lowering single occupancy vehicle trips.

Site Development Plans

- 22.) The TIA as provided by the Applicant notes that a school bus waiting area should be provided at an appropriate location in consultation with the Town. The Applicant should meet with the Town of Concord School Department and Department of Public Works to determine this location and provide detail information on the location and associated amenities within the Site Development Plans.
- 23.) The Applicant should provide turning templates showing the ability of refuse vehicles and Town of Concord fire apparatus to access, circulate, and egress the site through the circulation pattern of the internal private roadway without leaving the paved surface.

- 24.) The Site Development Plans do not appear to provide sufficient space along the private drive for a Town of Concord fire apparatus to turn around in the vicinity of buildings #27 / #28 and #13 / #14. Upon application of a turning template, should a fire apparatus not be able to complete a full U-turn, the Applicant should consider modifications at these points to further enlarge the roadway hammerheads as shown, and/or provide for an engineered pervious area beyond the asphalt to allow for complete turns.
- 25.) The Applicant should consider comments from the Concord Fire Department to install guidance / directional signage at the end of the entry driveway to denote the locations of street numbers to assist with resident location for fire safety.
- 26.) The Applicant should coordinate with the Town of Concord Fire Department for preferred locations of fire lanes (if needed), confirmation of hydrant locations, and sign requirements for fire lanes within the site. TEC does note that the current Site Development Plans as provided include locations for fire hydrants.
- 27.) The Town of Concord Road and Sidewalk Standard Details provide for a typical roadway cross-section with a minimum 22-foot pavement width. The Site Development Plans as provided depict a minimum roadway width of 22-feet in line with the standard detail. No response required.
- 28.) The Site Development Plans as provided depict an existing Town catch basin along the northerly side of Main Street in the middle of the proposed egress driveway location to Main Street. This creates the potential for existing stormwater ponding during rain/snow events to exist at the driveway opening. All water to this location is expected to be off-site related based on the stormwater infrastructure laid-out on-site. It is TEC's recommendation that the Applicant should consider a minor shift in the driveway location or provide for the relocation of the catch basin to remove it from the driveway opening. Note that should this be a low-point catch basin as opposed to a by-pass catch basin, the shift in driveway location would be a more feasible alternative.
- 29.) Section 7.7.2.1 of the Town of Concord Zoning Bylaw notes that minimum parking for a single- and two-family dwelling and planned residential development shall include "two (2) spaces per dwelling unit or one and one-half (1½) spaces per dwelling unit for subsidized low- and moderate-income housing or elderly housing developments." Upon inspection of the Representative Building Elevations and Floor Plans, all dwelling units appear to provide two indoor spaces and space for one outdoor parking stall at a minimum. TEC concurs that this bylaw is satisfied.
- 30.) The Site Development Plans as provided depict an on-site sidewalk network along one side of each roadway throughout parts of the Planned Residential Development. The Applicant should consider at a minimum the construction of sidewalk along one side of roadway throughout the entire project. This includes the entry and egress driveways, separate from the neighborhood park area, to provide connectivity to Main Street. The Applicant should further consider, if possible, the construction of sidewalk along both sides of each road in the development.
- 31.) The Applicant shall also provide further detail on the plan to the location and type of accessible ramps within the project and along the existing sidewalk across the driveways along Main Street. In addition, the construction details on Sheet 8 and Sheet 10 do not

provide detail for the several types of accessible ramps that may be needed throughout the site. Details for each ramp configuration type should be added to the Site Development Plans.

- 32.) The Applicant shall provide details within the plan to the type and material for crosswalk layout across the entry driveway and egress driveway, consistent with Town of Concord Standards and West Concord Master Plan recommendations. The Applicant should also provide similar detail, if different, to the type and material for crosswalk layout within the site.
- 33.) As the Site Development Plans depict two (2) dwelling units along Highland Street, the Applicant should consider providing sidewalk accommodations from the apex of Highland Street to Main Street along the frontage of the dwelling units. See Comment #21.
- 34.) It is reasonable to assume that operating speed along the internal private roadway would be 30 miles per hour (mph); however, TEC has assumed an operating speed of 25 mph to assess sight distance along the internal private roadway. The Site Development Plans as provided depict two (2) horizontal curvatures in the internal private roadway where the sight lines along the roadway are impeded and therefore do not attain a full 155-foot distance (25 mph) for at least one direction of travel:
 - Horizontal curvature between approximately STA 1+25 and STA 3+50 on the easterly side of the site. Both direction sight lines are obstructed by building #22; and
 - Horizontal curvature between approximately STA 2+50 and STA 4+25 on the westerly side of the site. Northbound travel sight lines are obstructed by building #16.
- 35.) The Site Development Plans as provided depict six (6) separate vertical curves located at PVI STA 0+25, STA 1+00, and STA 3+90 along the entry driveway and points east; as well as PVI STA 0+25, STA 1+50, and STA 4+00 along the egress driveway and points west, which are designed with K-values that are below the AASHTO minimum recommendations for sight distance along 30 mph roadways. Under as assumed 25 mph condition for the roadway, four (4) of these curves still are designed with K-values that are below the AASHTO minimum recommendations. The Applicant should consider an alternative grading design for these areas or the Applicant shall provide justification for each vertical curve location which is in conflict with AASHTO recommendations.
- 36.) There is currently no landscaping plan provided as part of the Site Development Plans. As these plans were not reviewed, TEC presents the following information:
 - The Applicant has not denoted the trimming or removal of vegetation along Main Street at the entry driveway, egress driveway, or Highland Street. Upon field visitations, TEC has noted that the ISD from the proposed exit driveway looking west is approximately 375-feet; which is slightly lower than the 392-feet as reported in the TIA. TEC finds that this may be related to finite locations in the field and considers the difference negligible. Assuming all vegetation is maintained, or removed; all ISD and SSD will be greater than AASHTO minimum recommendations. The Applicant should commit to remove and consistently

maintain vegetation to ensure sight lines remain unobstructed at the site driveways as noted in the TIA. The Applicant should also revise the Site Development Plans to provide sight triangles and measurements at each project intersection adjacent to the entry driveway, egress driveway, or Highland Street. All new vegetation and site signage should be kept low to not impede sight lines to/from the project driveways and Highland Street.

- As no internal landscaping plan is provided, TEC cannot assess whether sight lines along the internal private roadway will be further obstructed as noted in Comment #34. Upon compilation of the landscaping plan, the Applicant should take note of these sensitive horizontal curves along the internal private roadway and ensure that a 155-foot sight line along the roadway is maintained (assumes 25 mph operating speed).
- 37.) The Site Development Plans as provided do not include information to individual lots within the site and the current lot ownership. With the several horizontal curves along the internal private roadway, many sight lines; although sufficient distance wise, cross over private property, or future private property. The Applicant shall discuss with the developer the potential for sight line easements, if needed, at these locations in order to maintain the sight lines where future vegetation and potential on-lot storage (say parking an RV) can be restricted.
- 38.) The Applicant shall provide a dedicated plan for all traffic signage and pavement markings to be installed as part of the project. A sign summary shall also be included which depicts the sign legend, sign size, and sign lettering dimensions in compliance with the Manual on Uniform Traffic Control Devices (MUTCD).
- 39.) The Applicant shall provide a dedicated plan for all snow storage to be designated as part of the project.

Please do not hesitate to contact me directly if you have any questions concerning our peer review at 978-794-1792. Thank you for your consideration.

Sincerely,
TEC, Inc.
"The Engineering Corporation"



Samuel W. Gregorio, P.E., PTOE
Senior Traffic Engineer