

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

July 6, 2021

Ref.: T1108

Re: Traffic and Transportation Engineering Peer Review – Response to Comments
250 Old Bedford Road – Concord, Massachusetts

Dear Ms. Hughes:

On behalf of the Town of Concord, TEC, Inc. (TEC) reviewed documents as part of the traffic and transportation engineering peer review for the proposed childcare facility to be located at 250 Old Bedford Road in Concord, Massachusetts. Concord Children’s Center (the “Applicant”) submitted the following documents which TEC reviewed for conformance with the Town of Concord Zoning Bylaws and generally accepted industry standards:

- *Concord Children’s Center – 250 Old Bedford Road – Concord, Massachusetts (Response to TEC Peer Review Comments)*; prepared by Bayside Engineering, dated June 29, 2021;
- Site Plan entitled “*Concord Children’s Center at 250 Old Bedford Road – Concord, Massachusetts*,” prepared by Stamski and McNary, Inc.; dated June 22, 2021, REVISED.

For consistency, the original comment numbers have been retained from the most recent TEC Peer Review letter dated May 25, 2021. The Applicant’s responses to the comments are shown as **bold**; TEC’s responses are shown as *italic*.

Traffic Impact and Access Study

Comment No. 1: The traffic study area includes two (2) intersections in the vicinity of the site. Based upon the size and scope of the development, the proximity to the other outlying intersections, and the site’s trip generation, TEC finds that the study area as provided in the TIA may not be sufficient to capture the effects of the project on surrounding roadways based on Traffic Impact Assessment (TIA) guidelines set forth by MassDOT. This includes an evaluation of intersection in which the site-generated trips increase the peak hour traffic volume by more than 5 percent and/or by more than 100 vehicles per hour per MassDOT’s *TIA Guidelines* (Section 3.1.C). The Applicant should at a minimum provide a calculated value of % impact for the intersection of Old Bedford Road / Bedford Street (Route 62) and Old Bedford Road / Lexington Road based on the proximity and number of site generated trips distributed to those intersections. If an impact of greater of 5% persists, the Applicant should provide additional operational analysis and site related mitigation as warranted.

Bayside Response: The TIAS conservatively projects 51 and 43 additional trips expected to travel northerly during the weekday morning and weekday evening peak hours, respectively to the intersection of Old Bedford Road and Bedford Street. Similarly, 30 and 26 additional trips expected to travel southerly during the weekday morning and weekday evening peak hours, respectively to the intersection of Old Bedford Road and Lexington Road. It is important to note that these trips are not all new to the study area. The project consists of the relocation of relocating classrooms from two existing CCC locations in Concord. Three classrooms are from 134 Old Road to Nine Acre Corner (ORNAC) and three classrooms are from the Ripley School. The TIAS did not take any credit for these existing trips, particularly trips for the Ripley school (at the end of Meriam Road). As can be seen, the conservative projected increases are well less than 100 vehicles per hour.

The percent increase in volume attributable to the proposed CCC at the intersection of Old Bedford Road and Virginia Road (68 trips and 56 trips during the respective weekday morning and weekday evening peak hours) represents an approximate 7 percent increase in volume. As the volume to the north and south will be significantly less, the impacts at the two additional intersections will most likely be less than 5 percent.

Bedford Street and Old Bedford Road - Bedford Street forms the east leg and Old Bedford Road forms the east and south legs of this unsignalized three-legged intersection. The Bedford Street eastbound approach consists of a single lane permitting right-turns. The Old Bedford Road westbound approach consists of a single lane permitting left-turns. The Old Bedford Road northbound approach consists of a single lane permitting left or right-turns. The Old Bedford Road northbound approach operates under STOP-sign control. Sidewalks are provided on the north side of Bedford Street and Old Bedford Road and the east side of Old Bedford Road at the intersection. There is a crosswalk across the Old Bedford Road westbound approach. Land use at the intersection consists of residential homes.

Lexington Road and Old Bedford Road - Lexington Road forms the east and west legs and Old Bedford Road forms the north leg of this unsignalized three-legged intersection. The Lexington Road eastbound and westbound approaches each consist of a single lane permitting left or right turns. The Old Bedford Road southbound approach consists of a single lane approaching the intersection where left-and right-turns are separated by a raised, triangular shaped island. The Old Bedford Road approach operates under STOP-sign control. Sidewalks are provided on the north side of Lexington Road west of Old Bedford Road and along the west side of Old Bedford Road at the intersection. There is a crosswalk across Old Bedford Road approximately 180 feet north of the intersection. Land use at the intersection consists of residential homes and wooded land.

Weekday morning and evening turning movement counts were conducted at the two intersections on Wednesday June 9, 2021, at the intersections of Old Bedford Road and Bedford Street and Old Bedford Road and Lexington Road. The counts were seasonally adjusted for COVID (increased by a factor of 1.225 and projected to 2027 No-Build conditions using the growth projections contained within the TIAS. The site generated traffic volumes were then superimposed on the 2027 No-Build conditions to develop the 2027 Build conditions for the two intersections. The traffic counts and flow networks are included in the Appendix.

The 2027 Build volumes were compared to the 2027 No-Build volumes to determine the percent increase attributable to the project. The comparison is summarized in Table 1.

As shown in Table 1, the percent increase during the weekday morning peak hours is 5.1% or less.

Intersection analyses were performed for the two intersections and the results are summarized in Table 2. 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 at the study area intersections 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 from the HCM model overstate the actual delays experienced in the field. As shown in Table 2, during the future weekday evening peak hour, the critical movements at the intersection of Bedford Street and Old Bedford Road are projected to operate at LOS F, with or without the project. However, it is important to note that the unsignalized level-of-service results are conservative.

TEC Response:

TEC agrees that the critical gap parameter defined in the Synchro analysis software is conservative (typically around 6 to 7 seconds) and that reduction of the critical gap manually be even 1 second dramatically decreases the delay (improves the level of service) for the given movement. TEC would therefore concur with Bayside that the results as presented in the capacity and queue analysis are conservative.

In addition, TEC has reviewed the results of the capacity and queue analysis as shown for the two additional intersections and have the following observations:

- The delay per vehicle along Old Bedford Road NB at Bedford Street increases from approximately 20.7 seconds (LOS C) to 31.8 seconds (LOS D) during the weekday morning peak hour. Overall, the LOS on Old Bedford Road NB, a stop-controlled approach*

intersecting a mainline roadway, is not substantial and does not warrant specific mitigation.

- *The delay per vehicle along Old Bedford Road NB at Bedford Street increases from approximately 66.8 seconds (LOS F) to 108.0 seconds (LOS F) during the weekday evening peak hour. The V/C ratio increases to above 1.00 and the queue on this approach grows an additional 4 vehicles.*

Understanding the effects of critical gap on these results and the ability for delayed vehicles to bypass the LOS F by exiting the site to the south and turning right from Old Bedford Road SB at Lexington Street, the large LOS F is likely to not be fully experienced, or for only a short period of a typical weekday. Therefore, any major mitigation to the intersection, such as signalization (which is most likely not warranted) or other reconstructed treatments, may be excessive. The Old Bedford Road NB approach does provide a wide mouth at its intersection with Bedford Street and sufficient space within the Right-of-Way seems to exist where a possible mitigation alternative would be to box-widen (if necessary) and restripe the NB approach to consist of an exclusive left-turn lane and an exclusive right-turn lane. Although the delay for NB left-turn vehicles may be unchanged, right-turning vehicle in the queue will have their delay significantly decreased.

Comment No. 2: The traffic study does include a detailed evaluation of the site's exit driveway along Old Bedford Road but does not provide any evaluation of the site's entrance driveway along Virginia Road. The Applicant, at a minimum, should provide future year evaluation of this location to ensure queues along Virginia Road are not detrimental and whether turn lanes may be warranted.

Bayside Response: The intersection capacity analyses for the future build conditions were reviewed for the project. Based on the anticipated traffic generation and trip assignment, a very small percentage of site generated traffic will be approaching the site from the east on Virginia Road. This volume of traffic will not cause any significant vehicle queuing as shown on the capacity analysis sheets included in the appendix. Most of the traffic will be turning right into the site and will not be affected by any queuing on the Virginia Road approach.

Further, a review of the projected vehicle queuing on Virginia Road at Old Bedford Road indicates a 95th percentile queue of two (2) vehicles during the weekday morning peak hour and eight (8) vehicles during the weekday evening peak hour. This queue during the weekday evening peak hour would have a small effect on site generated traffic, but as the projection is relatively small, it will not affect overall operations or require exclusive turning lanes.

TEC Response: TEC concurs that the vehicle queue at the entrance driveway as reported are less than one vehicle on average and will not substantially affect operations along Virginia Road. TEC concurs that the queue along Virginia

Road at Old Before Road is not substantially changed by the introduction of site generated traffic. Bayside has not provided calculation materials related to left-turn lane warrants.

Comment No. 3: The Applicant has provided traffic data collection within the study area based on counts completed prior to the onset of the COVID-19 pandemic. TEC agrees, therefore, that no pandemic related adjustment to traffic volumes is warranted. Based on the additional locations described in Comment #1, the Applicant may be well served to recount the intersection of Old Bedford Road / Virginia Road along with counts at these two new locations to provide a potential adjustment for reduction of traffic related to COVID-19.

Bayside Response: **Bayside performed the additional TMC's at the two intersections described in the response to Comment No. 1. These intersections were adjusted for COVID. There was no need to recount Old Bedford Road and Virginia Road as a comparison of volumes approaching the intersection from the north and south were higher than the volumes just observed in June at the two additional intersections.**

TEC Response: *TEC generally concurs that the information provided for June 2021 traffic counts in related to COVID-19 (a 22.5% increase) as it correlates with other COVID volume discrepancies TEC has calculated on various projects. The calculation data for this parameter was not provided with the Applicant's submittal package. TEC reached out to Bayside Engineering directly to obtain the information which was given on July 2, 2021. TEC concurs with the calculations provided.*

Comment No. 4: The TIAS utilizes a seasonal adjustment factor of 2% based on the average of counts stations 403 and 4065; both along Route 2 within Concord. TEC concurs with the methodology and the data provided by the Applicant.

Bayside Response: **Bayside Concur**

TEC Response: *Comment Closed. No further response required.*

Comment No. 5: The safety analysis section for the report covers the recent crash history of the study intersections. The data appears to be missing a crash that occurred on October 18, 2019. Although this crash is missing from the data, the presence of only two crashes at these two intersections generally reflects no specific crash trend. Further crash analysis should be conducted for additional study area intersections if warranted.

Bayside Response: **A crash analysis was conducted for the additional study area intersections. Crash data from MassDOT's IMPACT website was reviewed for the two intersections. The crash data is included in the Appendix.**

A review of the data indicated that at Bedford Street and Old Bedford Road, an average of 1.33 crashes per year occurred between January 1, 2015, and December 31, 2020. At the intersection of Lexington Road and Old Bedford Road, an average of 1.83 crashes per year occurred between January 1, 2015, and December 31, 2020. A review of the

crash data did not identify any specific discernable patterns. Also, the crash rate was determined to be well below MassDOT's average crash rates.

TEC Response: TEC concurs with Bayside that intersections that generally experienced less than 2 'reported' crashes per year (unless crash rate is higher than statewide and District-wide averages) do not indicate specific crash trends or safety related issues. The crash rate reported for each intersection (0.29 and 0.44 crashes per MEV) are each well below the statewide and District-wide averages for unsignalized intersections.

Comment No. 6: The TIAS identifies a 1.0 percent per year growth rate of traffic, double the projections from the Central Transportation Planning Staff (CTPS) estimates. TEC concurs with the methodology and the data provided by the Applicant.

Bayside Response: Bayside Concur

TEC Response: Comment Closed. No further response required.

Comment No. 7: The TIAS identified additional traffic to the roadway based on a proposed three (3) dwelling unit project at #430 Old Bedford Road. The level of impact for three units is generally negligible; however, the Applicant has projected traffic on the roadway for these units based on industry standard trip methodology (ITE fitted curve) resulting in a conservative number of peak hour trips. TEC has no objection to the methodology utilized.

Bayside Response: Bayside Concur

TEC Response: Comment Closed. No further response required.

Comment No. 8: TEC has reviewed the Applicant's trip generation methodology which uses the more conservative value for each peak period between empirical data and ITE data. TEC concurs with this methodology.

Bayside Response: Bayside Concur

TEC Response: Comment Closed. No further response required.

Comment No. 9: The distribution of traffic was based on the addresses of the current student population as provided by the Concord Children's Center. No specific data was provided in the Appendices; however, based on the sensitive nature of the information, TEC will assume that the data as presented in the TIAS is correct.

Bayside Response: Bayside Concur

TEC Response: Comment Closed. No further response required.

Comment No. 10: The comments as noted above may result in modifications to the results of the capacity and queue analysis and therefore TEC reserves the right to provide additional comments and improvement recommendations upon completion of the peer review comment responses.

Bayside Response: Bayside Concur

TEC Response: *Comment Closed. No further response required based on responses for Comment No. 1 through Comment No. 3.*

Comment No. 11: The capacity and queue analysis analyze of the unsignalized intersections using the Highway Capacity Manual (HCM) 2010 methodology instead of the current industry standard HCM 6th Edition methodology. Although TEC does not necessarily expect a significant difference with the usage of 2010 methodology, the Applicant should provide specific justification for its use over HCM 6th Edition, such as a specific parameter that is preventing the use of recent HCM methodology.

Bayside Response: **There was found to be no difference between the HCM 6th Edition and the 2010 HCM methodology. The analyses using the HCM 6th Edition are included in the Appendix and a review of the level of service results indicate the 6th Edition results are exactly the same as the 2010 methodology.**

TEC Response: *Comment Closed. No further response required.*

Comment No. 12: Movements from Virginia Road at its intersection with Old Bedford Road are anticipated to increase from level-of-service (LOS) C to LOS D during both the weekday morning and weekday evening peak hours. Although the level-of-service designation does reduce, the delay per vehicle reported increases by no more than 6 seconds between the No-Build and Build condition. The change in level-of-service occurs because the delay during the No-Build condition is currently at the LOS C/D threshold. Since the delay increases by no more than 6 seconds per vehicle, the maximum queue increases by one vehicle or less, and the volume-to-capacity (v/c) ratio is well below 1.00 during both the weekday morning and weekday evening peak hour, the impact of the project on the intersection is generally negligible for the stop-controlled approach.

Bayside Response: **Bayside Concurs**

TEC Response: *Comment Closed. No further response required.*

Comment No. 13: TEC concurs that the overall, the project is not expected to significantly cause noticeable new impact to each study area intersection reported. This comment is subject to change based on response to Comment #1.

Bayside Response: **Bayside Concurs**

TEC Response: *Comment Closed. No further response required.*

Comment No. 14: Sight distance measurements provided by Bayside Engineering show that sight lines to the north and south of the exist driveway are in excess of AASHTO recommendation for the 85th percentile speeds as measured by the Automatic Traffic Recorders (ATRs). At a minimum, the Applicant should commit to clear vegetation, in coordination with the Town, along the westerly side of Old Bedford Road and southerly side of Virginia Road within the Town's right-of-way to ensure sight lines are continuously met. This is noted in the TIAS.

Bayside Response: **Bayside Concurs**

TEC Response: Comment Closed. No further response required.

Comment No. 15: The Applicant should commit to a formalized pick-up and drop-off plan in coordination with the Town to ensure the relative trip generation and parking thresholds are maintained by the site. Understanding that the student population will change on a year-to-year basis, it is reasonable that any thresholds are subjected to a reasonable plus/minus tolerance within such a plan.

Bayside Response: Bayside Concurs

TEC Response: Comment Closed. No further response required.

Site Plan - Transportation

Comment No. 16: The Applicant should confirm on the Site Plans the sight distance triangles both directions from the site's exit driveway along Old Bedford Road. The Site Plans should indicate the areas within those sight triangles where vegetation and signage are to be removed or kept low.

Bayside Response: A sight distance triangle has been added to the plans showing the intersection sight distance in both directions from the site's exit driveway onto Old Bedford Road. Signage/vegetation within the triangle area will be removed or kept low as appropriate.

TEC Response: Comment Closed. No further response required.

Comment No. 17: The Applicant should provide a vehicular circulation plan which shows that a garbage truck (front-loading) can adequately circulate the site and access the dumpster enclosure. Note that the truck should maintain the same directional flow during pick-up as traditional vehicles and avoid all usable parking stalls.

Bayside Response: A turning analysis for a garbage truck has been provided on the revised plans and confirms the truck will maintain the same directional flow during pick-up as traditional vehicles and avoids all useable parking stalls.

TEC Response: The turning template for the garbage truck appears to circulate the site appropriately; however, movement shown in the template is tight around the exit location. The Applicant should consider programming site garbage pick-up that is not during the typical pick-up, drop-off, and other peak movement periods where a vehicle is more likely to be in the last parallel space near the exit driveway.

Comment No. 18: The Site Plans do not appear to provide sufficient space for a standard vehicle in the first parking space along the Virginia Road frontage to reverse and exit the site without potential backing out onto Virginia Road while also avoiding the adjacent parking space. TEC asks that the Applicant provide a turning template for a standard passenger vehicle in this stall.

Bayside Response: The parking lot layout has been modified slightly. The exit driveway was shifted west, increasing the distance between the intersection at

Virginia Road and Old Bedford Road. This created room for an additional parallel parking space which allowed for the space closest to Virginia Road to be removed without decreasing the total number of parking spaces. A turning analysis has been provided for the parking space closest to Virginia Road to demonstrate a passenger cars ability to back out without backing into the Right of Way (ROW).

TEC Response: *The turning template provided by the Applicant shows a typical passenger vehicle turning out of the relocated final parking space and is able to U-turn directly to the main drive aisle. The movement is still tight comparative to a typical exiting maneuver and may need to be further examined for a larger vehicle, such as a pick-up truck. The Applicant should consider making this parking space designated for an employee so that movements from this space are not during the typical pick-up, drop-off, and other peak movement periods.*

Comment No. 19: The dimensions of the parking spaces and the adjacent parking drive aisles meet Town of Concord Zoning requirements.

Bayside Response: Bayside Concur

TEC Response: *Comment Closed. No further response required.*

Comment No. 20: A stop-sign and stop-line should be proposed at the terminus of the exit driveway along Old Bedford Road. The plan set should include a sign summary table for all on-site signage that depicts the sign legend, sign size, and sign lettering dimensions in compliance with the Manual on Uniform Traffic Control Devices (MUTCD).

Bayside Response: A stop sign and stop line at the exit driveway have been added on the revised plan. A summary table for all on-site signage depicting size and lettering dimensions has been added to the site plans.

TEC Response: *Comment Closed. No further response required.*

Comment No. 21: The site does not meet the minimum requirements for number of total parking stalls per Concord Zoning requirements. Based on the description provided by the Applicant for drop-off and pick-up, it seems that the number of parking spaces provided will be adequate. Although TEC finds that the number of stalls may be adequate, the Applicant should provide a variance request to the Town. In addition, the Applicant should provide the location for potential additional parking spaces for future use (not constructed) should the childcare population be expanded.

Bayside Response: A request for parking relief was submitted with the initial application to the Town on April 1, 2021. There is no intention of expanding the childcare population. The Ripley school, 0.3 miles away from the project site, has allotted two parking spaces in their parking lot for daily use for additional parking for 250 Old Bedford Road if needed.

TEC Response: *Comment Closed. No further response required.*

Comment No. 22: The site plans should include a crosswalk detail and a detail for traffic signage which includes signage height.

Bayside Response: A crosswalk detail and traffic signage details have been provided on the revised plan.

TEC Response: A crosswalk detail was provided on the turning analysis sheet, however; no sign height detail was provided on the plan. As a condition on any approval, should note the Applicant provide a detail of appropriate sign height for the stop sign, do not enter, and one-way signs with a minimum clearance to bottom of sign height of 7-feet.

Comment No. 23: The typical driveway detail notes the maximum cross-slope as 2%. Please revise the detail to note a maximum 1.5% cross-slope with 0.5%± tolerance to ensure all sidewalks are below the Massachusetts Architectural Access Board (AAB) maximum of 2.0%.

Bayside Response: The driveway detail has been updated to reflect a max cross-slope of 1.5%.

TEC Response: Comment Closed. No further response required.

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

Sincerely,
TEC, Inc.
“The Engineering Corporation”



Samuel W. Gregorio, PE, PTOE, RSP₁
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