

Ref.: 22113

November 7, 2022

Mr. Joe Cincotta  
275 Lexington Street  
Waltham, MA 02452

Reg.: Vineyard Lane Subdivision  
261 Gardner Street, Hingham, MA

Dear Joe:

**Chappell Engineering Associates, LLC** has investigated the available sight distances at the potential site driveway location for a proposed subdivision of land to be located on Gardner Street in Hingham, Massachusetts. As shown on the plan set entitled “*Definitive Subdivision Plan for Vineyard Lane, Hingham, MA, prepared for Mr. Joseph Cincotta, prepared by Civil Design Group, LLC dated September 9, 2022,*” access will be provided via a proposed subdivision street (Vineyard Lane). The subdivision street will be located off of Gardner Street, just west of Kress Field.

Speed measurements were conducted along Gardner Street near the proposed subdivision road by measuring the elapsed time for vehicles traveling a short, pre-measured distance between two checkpoints. The travel time was recorded using automatic traffic recorders and the speed is derived by dividing the elapsed time into the measured distance between checkpoints. There is a sharp 90 degree turn in Gardner Street traveling eastbound approximately 160 feet west of the proposed subdivision street. Therefore, vehicle speed information along Gardner Street traveling eastbound at the exact location of the proposed site driveway was also collected via speed radar detector on Wednesday, November 2, 2022. The results of the speed measurements are summarized in Table 1. Based on a field investigation, the posted speed limit on Gardner Street is 25 miles per hour (mph) in both directions.

As shown, the recorded average travel speed traveling eastbound was found to be lower than the posted speed limit with 17 mph. Traveling westbound, the average travel speed was found to be slightly higher than the posted speed limit with 29 mph. The 85<sup>th</sup> percentile travel speed traveling

eastbound was found to be slightly lower than the posted speed limit with 20 mph, while traveling westbound the average travel speed was found to be higher than the posted speed limit with 34 mph. The lower speeds traveling eastbound are due to the presence of the sharp 90 degree turn just west of the subdivision street. The higher speed between the 85<sup>th</sup> percentile speed and the posted speed limit was accordingly used in the calculation of minimum sight distance requirements, as described below.

**Table 1**  
**Observed Travel Speeds <sup>a</sup>**

| <u>Location/Direction</u>           | <u>Posted Speed Limit</u> | <u>Average Speed</u> | <u>85<sup>th</sup> Percentile Speed <sup>b</sup></u> |
|-------------------------------------|---------------------------|----------------------|--|
| <b>Gardner St. adjacent to site</b> |                           |                      |  |
| Eastbound                           | 25                        | 17                   | 20   |
| Westbound                           | 25                        | 29                   | 34   |

<sup>a</sup> In miles per hour (mph).

<sup>b</sup> Speed at, or below which 85 percent of all observed vehicles travel.

To identify potential safety concerns associated with site access and egress, sight distances have been evaluated at the proposed Vineyard Lane location on Gardner Street to determine if the available sight distances for vehicles exiting the site meet or exceed the minimum distances required for approaching vehicles to safely stop. The available sight distances were compared with minimum requirements, as established by the American Association of State Highway and Transportation Officials (AASHTO).<sup>1</sup> AASHTO is the national standard by which vehicle sight distance is calculated, measured, and reported. The Massachusetts Department of Transportation (MassDOT) and the Executive Office of Energy and Environmental Affairs (EEA) require the use of AASHTO sight distance standards when preparing traffic impact assessments and studies, as stated in their guidelines for traffic impact assessments.

Sight distance is the length of roadway ahead that is visible to the driver. Stopping Sight Distance (SSD) is the minimum distance required for a vehicle traveling at a certain speed to safely stop before reaching a stationary object in its path. The values are based on a driver perception and reaction time of 2.5 seconds and a braking distance calculated for wet, level pavements. When the roadway is either on an upgrade or downgrade, grade correction factors are applied. Stopping sight distance is measured from an eye height of 3.5 feet to an object height of 2 feet above street level,

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<sup>1</sup>*A Policy on Geometric Design of Highways and Streets, 7<sup>th</sup> Edition*; American Association of State Highway and Transportation Officials (AASHTO); 2018.

equivalent to the taillight height of a passenger car. The SSD is measured along the centerline of the traveled way of the major road.

Intersection sight distance (ISD) is provided on minor street approaches to allow the drivers of stopped vehicles a sufficient view of the major roadway to decide when to enter the major roadway. By definition, ISD is the minimum distance required for a motorist exiting a minor street to turn onto the major street, without being overtaken by an approaching vehicle reducing its speed from the design speed to 70 percent of the design speed. ISD is measured from an eye height of 3.5 feet to an object height of 3.5 feet above street level. The use of an object height equal to the driver eye height makes intersection sight distances reciprocal (i.e., if one driver can see another vehicle, then the driver of that vehicle can also see the first vehicle). When the minor street is on an upgrade that exceeds 3 percent, grade correction factors are applied.

SSD is generally more important as it represents the minimum distance required for safe stopping while ISD is based only upon acceptable speed reductions to the approaching traffic stream. However, the ISD must be equal to or greater than the minimum required SSD in order to provide safe operations at the intersection. In accordance with the AASHTO manual, *“If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.”* Accordingly, ISD should be at least equal to the distance required to allow a driver approaching the minor road to safely stop.

The available sight distances at the proposed Vineyard Lane location on Gardner Street were measured and compared to minimum requirements as established by AASHTO. The 85<sup>th</sup> percentile speed traveling westbound was used over the posted speed limit of 25 mph to determine the minimum required sight distance looking right, while the posted speed limit traveling eastbound was used to determine minimum required sight distance looking left as the posted speed limit is higher than the observed speeds. The required minimum sight distances are compared to the available distances, as shown in Table 2.

**Table 2**  
**Sight Distance Summary**

| Location/Direction                   | Intersection Sight Distance (feet) |                               |                        |
|--------------------------------------|------------------------------------|-------------------------------|------------------------|
|                                      | Measured                           | Minimum Required <sup>a</sup> | Desirable <sup>b</sup> |
| <b>Gardner St. at the Site Drive</b> |                                    |                               |                        |
| East of Intersection                 | 170                                | 155                           | 280                    |
| West of Intersection                 | 500+                               | 235                           | 280                    |

<sup>a</sup> Values based on AASHTO SSD requirements for the 85<sup>th</sup> percentile speed of 34 mph traveling westbound and the posted speed limit of 25 mph traveling eastbound.

<sup>b</sup> Values based on AASHTO ISD requirements for the posted speed limit of 25 mph on Gardner Street.

As shown in the table, the minimum required sight distances are exceeded at the proposed intersection of Gardner Street and Vineyard Lane and safe operation can therefore be expected. To ensure sight lines are achieved, all existing vegetation should be trimmed or removed within the sight triangle (as defined by AASHTO). Based on the plan set, all of this vegetation removal occurs on land controlled by the proponent and within the Gardner Street right-of-way. It is recommended that the sight triangles be shown on the site plan to identify the areas of vegetation removal/trimming. It is further recommended that any proposed landscaping, fences, or signs in the vicinity of the driveway be kept low to the ground (maximum 2 feet in height from street level), or set back outside of the sight triangles so as not to impede the available sight distances.

Please feel free to contact me should you have any questions regarding the above.

Sincerely,

*Chappell Engineering Associates, LLC*



Kirsten Braun, P.E.  
Project Manager