

August 31, 2021

NEX-2021064.00

Ms. Jennifer Williams  
Ora, Inc.  
300 Brickstone Square  
Andover, Massachusetts 01810

SUBJECT: Sight Distance Evaluation Letter  
Proposed Worksite  
55 Waldingfield Road – Ipswich, Massachusetts

Dear Ms. Williams:

Greenman-Pedersen, Inc. (GPI) has prepared this *Sight Distance Evaluation Letter* for a proposed worksite redevelopment to be located at 55 Waldingfield Road in Ipswich, Massachusetts. The site currently occupies the Julia Bird Estate consisting of 32,781 square feet (SF) of space within the main house, carriage house, school house, pool house, farm house, and barn. The project consists of redeveloping the existing buildings into the Ora, Inc. worksite that will be relocated from Andover, Massachusetts. The full project will be done in four phases:

1. Phase 1A – renovation and addition at mansion
2. Phase 1B – equestrian center, farms house renovation and barn addition
3. Phase 2 – office building and relocation of pool house
4. Phase 3 – health and wellness building and relocation of schoolhouse

At this time, however, there is no timeframe for Phases 2 and 3. Access and egress is currently provided via two curb cuts on Waldingfield Road. Access and egress to the project is expected to remain the same, however, the western driveway will be shifted approximately 30 feet to the east and realigned to meet Waldingfield Road at ninety degrees rather than at a forty-five degree angle as it is today. This new location will provide enhanced sight distances looking to the east.

To identify potential safety concerns associated with site access and egress, sight distances have been evaluated at the proposed site driveway locations 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, equivalent to the taillight height of a passenger car. The SSD is measured along the centerline of the traveled way of the major road.

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

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. The ISD, however, 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 SSD and ISD at the proposed site driveway locations were measured and compared to minimum requirements as established by AASHTO. Based on the enforced and observed speeds, the SSD and ISD requirements at the intersections were calculated. The sight distance calculations are attached to this letter. The required minimum sight distances for the driveways are compared to the available distances, as shown in Table 1.

**TABLE 1**  
**Sight Distance Summary**

Location/Direction	Stopping Sight Distance (feet)		Intersection Sight Distance (feet)		
	Measured	Minimum Required <sup>a</sup>	Measured	Minimum Required <sup>b</sup>	Desirable <sup>c</sup>
<b>Waldingfield Road at Western Site Driveway:</b>					
<i>East of intersection (WB)</i>	235	220	260	220	240
<i>West of intersection (EB)</i>	355	255	440	255	280
<b>Waldingfield Road at Eastern Site Driveway:</b>					
<i>East of intersection (WB)</i>	500+	220	500+	220	240
<i>West of intersection (EB)</i>	345	260	405	260	280

<sup>a</sup> Values based on AASHTO requirements for minimum SSD based on 85<sup>th</sup> percentile speed of 33 mph (WB) and 35 mph (EB) on Waldingfield Road.

<sup>b</sup> Values based on AASHTO requirements for SSD.

<sup>c</sup> Values based on AASHTO requirements for ISD for posted speed of 25 mph on Waldingfield Road.

<sup>d</sup> Measurement to end of roadway.

**As indicated in Table 1 above, available sight distances at the proposed site driveways on Waldingfield Road exceed the minimum SSD and ISD requirements for safe operation as well as the desirable ISD.** The sight distances at western site driveway looking east are restricted to the measured distances shown in the table due to a tree on the other side of the Waldingfield Road located along the horizontal curve as shown in Figures 1 and 2. With the removal of this tree, the SSD of 235 feet and the ISD of 260 feet would be enhanced.



Figure 1. View from newly proposed western site driveway location looking east



Figure 2. View of the proposed site driveways from the east

In order to maintain the sight distances at the driveways after redevelopment of the site, it is recommended that any proposed plantings, vegetation, landscaping, and signing along the site frontage be kept low to the ground (no more than 3.0 feet above street level) or set back sufficiently from Waldingfield Road so as not to inhibit the available sight lines.

Sincerely,

**GREENMAN-PEDERSEN, INC.**

A handwritten signature in cursive script that reads "Heather Monticup".

Heather L. Monticup, P.E.  
Assistant Vice President / Director of Traffic Engineering – Land Development

enclosure(s)

1. Sight Distance Calculations

## AASHTO Recommended Sight Distance Summary (Passenger Vehicles)

LOCATION: Waldingfield Road at Site Driveway West

Side Street Direction: SB  
 Number of Lanes on Mainline = 2  
 Median Width (Feet) = 0

### STOPPING SIGHT DISTANCE

Mainline Direction: WB  
 85th Percentile Speed (V) = 33 MPH  
 Grade (G) = 2.0%  
 Apply Grade Adjustment Yes  
 Brake Reaction Time (T) = 2.5 seconds  
 Deceleration Rate (A) = 11.2 ft/s<sup>2</sup>  
 SSD = 1.47 V \* T + 1.075 V<sup>2</sup>/A = 220 FT  

<b>SSD =</b>	<b>220 FT</b>
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Mainline Direction: EB  
 85th Percentile Speed (V) = 35 MPH  
 Grade (G) = -2.0%  
 Apply Grade Adjustment Yes  
 Brake Reaction Time (T) = 2.5 seconds  
 Deceleration Rate (A) = 11.2 ft/s<sup>2</sup>  
 SSD = 1.47 V \* T + 1.075 V<sup>2</sup>/A = 254 FT  

<b>SSD =</b>	<b>255 FT</b>
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### INTERSECTION SIGHT DISTANCE

RIGHT TURN FROM STOP: East of Driveway  
 Posted Speed (V) = 25 MPH  
 Minor Street Approach Grade (G) = 0.0%  
 Apply Grade Adjustment No  
 Time Gap (t<sub>g</sub>) = 6.5 seconds  
 ISD (Right Turn from Stop) = 1.47 \* t<sub>g</sub> \* V = 239 FT  

<b>ISD (Right Turn from Stop) =</b>	<b>240 FT</b>
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LEFT TURN FROM STOP: West of Driveway  
 Posted Speed (V) = 25 MPH  
 Minor Street Approach Grade (G) = 0.0%  
 Apply Grade Adjustment No  
 Time Gap (t<sub>g</sub>) = 7.5 seconds  
 ISD (Left Turn from Stop) = 1.47 \* t<sub>g</sub> \* V = 276 FT  

<b>ISD (Left Turn from Stop) =</b>	<b>280 FT</b>
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## AASHTO Recommended Sight Distance Summary (Passenger Vehicles)

LOCATION: Waldingfield Road at Site Driveway East

Side Street Direction: SB  
 Number of Lanes on Mainline = 2  
 Median Width (Feet) = 0

**STOPPING SIGHT DISTANCE**

Mainline Direction: WB  
 85th Percentile Speed (V) = 33 MPH  
 Grade (G) = 3.0%  
 Apply Grade Adjustment Yes  
 Brake Reaction Time (T) = 2.5 seconds  
 Deceleration Rate (A) = 11.2 ft/s<sup>2</sup>  
 SSD = 1.47 V \* T + 1.075 V<sup>2</sup>/A = 218 FT  

<b>SSD =</b>	<b>220 FT</b>
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Mainline Direction: EB  
 85th Percentile Speed (V) = 35 MPH  
 Grade (G) = -3.0%  
 Apply Grade Adjustment Yes  
 Brake Reaction Time (T) = 2.5 seconds  
 Deceleration Rate (A) = 11.2 ft/s<sup>2</sup>  
 SSD = 1.47 V \* T + 1.075 V<sup>2</sup>/A = 258 FT  

<b>SSD =</b>	<b>260 FT</b>
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**INTERSECTION SIGHT DISTANCE**

RIGHT TURN FROM STOP: East of Driveway  
 Posted Speed (V) = 25 MPH  
 Minor Street Approach Grade (G) = 0.0%  
 Apply Grade Adjustment No  
 Time Gap (t<sub>g</sub>) = 6.5 seconds  
 ISD (Right Turn from Stop) = 1.47 \* t<sub>g</sub> \* V = 239 FT  

<b>ISD (Right Turn from Stop) =</b>	<b>240 FT</b>
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LEFT TURN FROM STOP: West of Driveway  
 Posted Speed (V) = 25 MPH  
 Minor Street Approach Grade (G) = 0.0%  
 Apply Grade Adjustment No  
 Time Gap (t<sub>g</sub>) = 7.5 seconds  
 ISD (Left Turn from Stop) = 1.47 \* t<sub>g</sub> \* V = 276 FT  

<b>ISD (Left Turn from Stop) =</b>	<b>280 FT</b>
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