June 5, 2024

Matt Rapke
Director of Development
Wilson Developments
[redacted]

Dear Mr. Rapke:

RE: Entrance Safety Assessment at 37 Yonge Street, Municipality of Brockton, Ontario

1.0 INTRODUCTION

1.1 Background

A new 30-unit townhouse development located at 37 Yonge Street North in the Town of Walkerton, within the Municipality of Brockton ('the municipality'), Ontario, is proposed by Wilson Developments. In response to the municipality's request, True North Safety Group ('TNS') was retained to conduct a safety assessment of the new intersection at this location. Our safety assessment consisted of the following:

- Complete a comprehensive field investigation of the subject intersection to observe road user behaviours/speeds at the new intersection on Yonge Street North, and measure stopping, approach, and departure sight line distances both approaching and at the intersection.
- Assess the sight lines requirements based on prevailing Transportation Association of Canada ('TAC') design guidelines with consideration of the nature and location of the intersection.
- Determine if the subject intersection can provide adequate safety levels and identify potential remedial measures to improve safety at the intersection.

1.2 Study Area

The new intersection is located on Yonge Street North approximately 30 m south of Valleyside Drive, and will be a three-leg, minor stop-controlled intersection with a STOP sign installed on the eastbound approach. The land use within the vicinity of the study area intersection is predominantly suburban residential on all corners and becomes increasingly rural residential north of Valleyside Drive.

In the vicinity of the subject intersection, Yonge Street North is a collector roadway running north-south, and Valleyside Drive is a local road running east-west. The posted speed limit on Yonge Street North is 40 km/h and becomes 50 km/h approximately 100 m north of Valleyside Drive. The speed limit is unposted on Valleyside Drive.

Figure 1 provides an aerial image of the study area.

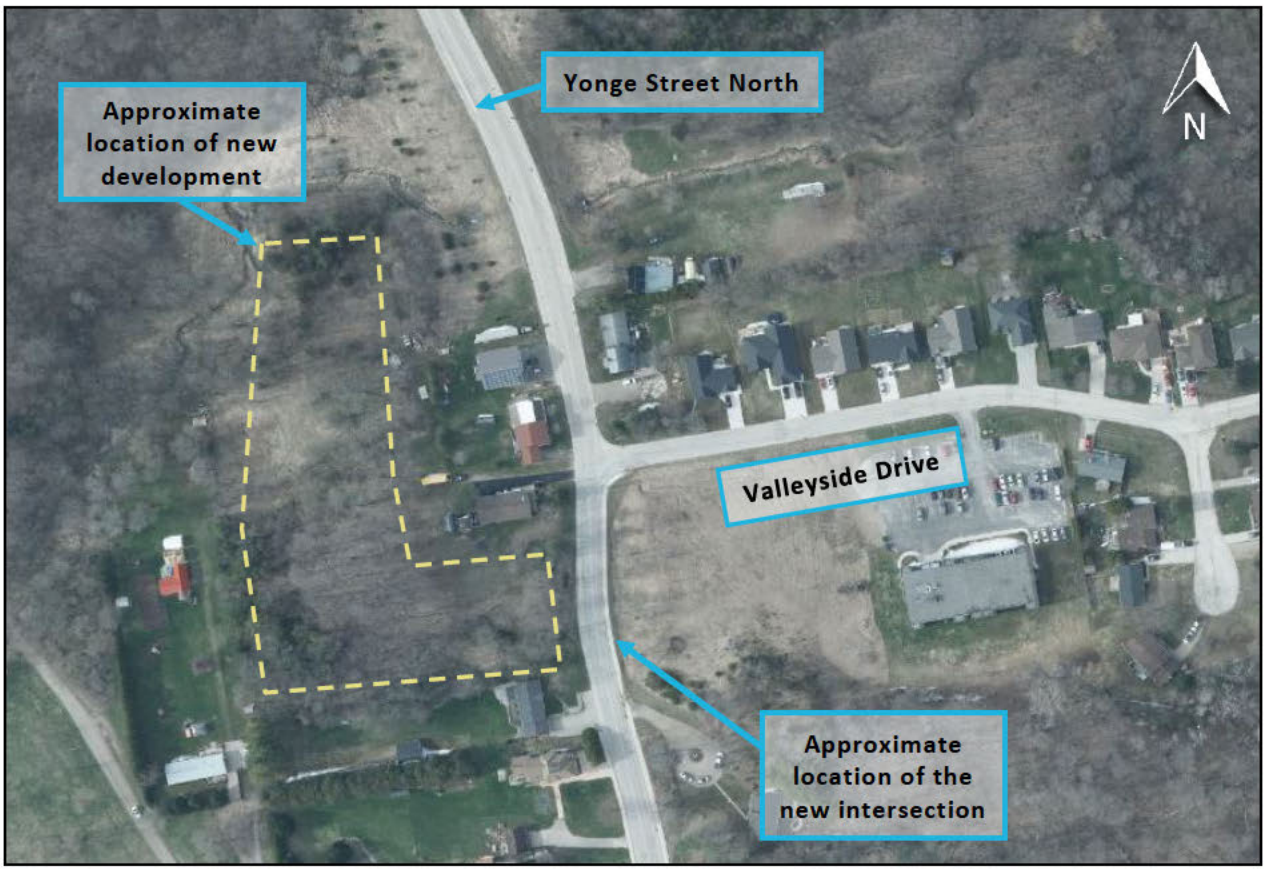

Figure 1: Aerial image of the study area[1].

North of the development, the intersection of Yonge Street North and Valleyside Drive is a three-leg, minor stop-controlled intersection with a STOP Sign installed on the westbound approach. A three-way overhead red/amber flashing beacon is installed at the intersection (shown in **Figure 2**), and HIDDEN INTERSECTION signs with amber flashing beacons mounted on top are installed on the northbound/southbound approaches.

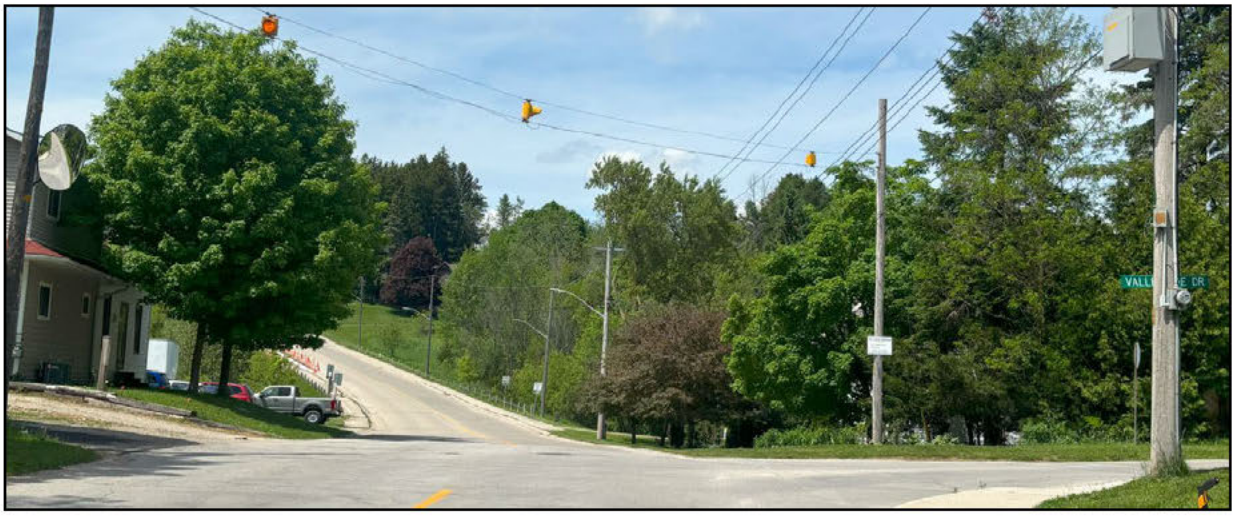

Figure 2: Northbound view at Valleyside Drive showing 3-way flashing beacons (TNS, 2024).

[1] https://maps.brucecounty.on.ca/Geocortex/Html5Viewer/index.html?viewer=BruceMaps, Retrieved on May 21, 2024

South of Valleyside Drive, there is a sidewalk providing access to the intersection on the east side of Yonge Street North, as well as a sidewalk on the west side that begins approximately 90 m south of Valleyside Drive. North of Valleyside Drive, there are paved asphalt boulevards on both sides of Yonge Street North that begin approximately 30-50 m north of the intersection and terminate approximately 460 m north of the intersection. While not designated as pedestrian facilities, they provide refuge on a steep downgraded section of the southbound approach (measured to be approximately 9%). There are no pedestrian facilities on Valleyside Drive, and there is no controlled crossing at the intersection (shown in **Figure 3**).

Figure 3: Pedestrian facilities at Valleyside Drive/Yonge Street North.

1.3 New Development Driveway

The new development includes a 38-stall driveway that will connect to Yonge Street North approximately 30 m south of Valleyside Drive. The driveway will be approximately 7.3 meters wide and will slope downward toward Yonge Street North at a 6.5% grade. The development site plan is shown in **Figure 4.**

Figure 4: Site plan showing the driveway for the new townhouse development at 37 Yonge Street North.

2.0 SAFETY ASSESSMENT

2.1 Sight Lines Assessment

2.1.1 Roadway Function and Speed

The posted speed limit on Yonge Street North is 40 km/h and becomes 50 km/h approximately 100 m north of Valleyside Drive. The speed limit is unposted on Valleyside Drive and follows the statutory speed limit of 50 km/h, set out in the Highway Traffic Act (HTA, R.S.O. 1990, c. H.8). Typically, common practice is to assume a 'design speed' (a road design parameter) of 10 to 20 km/h over the posted speed limit for a paved roadway. The design speed is applied in decision-making regarding the appropriate road design features (i.e., road/shoulder widths, horizontal curves and vertical curves, and roadside design and protection) and traffic control devices. Based on our field observations, it is reasonable to assume a design speed of 60 km/h.

2.1.2 Stopping Sight Distance

Stopping Sight Distance (SSD) is defined in the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads ('the TAC Guide') as: "*the sum of the distance travelled during the perception and reaction time and the braking distance.*"[2] In other words, the SSD is the distance required by a driver to perceive an object (e.g., a vehicle entering the roadway

[2] Geometric Design Guide for Canadian Roads, 2017, Transportation Association of Canada

from a minor street), identify the object and the reaction required, react (e.g., lift their foot from the accelerator and place it on the brake), and bring their vehicle to a stop.

The 2017 Transportation Association of Canada Geometric Design Guide for Canadian roads ('TAC Guide') indicates a minimum SSD of 85 m is required on a level road surface for a 60 km/h design speed and of 65 m for a design speed of 50 km/h. When accounting for the northbound approach upgrade of approximately 9%, the required northbound SSD becomes 75 m. Within the SSD on the southbound approach, the downgrade levels out to approximately 2%. Since the roadway is relatively level at the driveway, the required southbound SSD is 85 m.

According to our field measurements, the available SSD on the approach to the subject intersection is approximately 65 m for northbound motorists and approximately 62 m for southbound motorists. Therefore, the available SSDs (shown in **Figure 5** and **Figure 6**) provided on both approaches to the subject intersection are insufficient for a 60 km/h design speed. The SSDs are more representative of a 60 km/h design speed.

Figure 5: View of a northbound motorist approaching the new driveway – SSD (TNS, 2024).

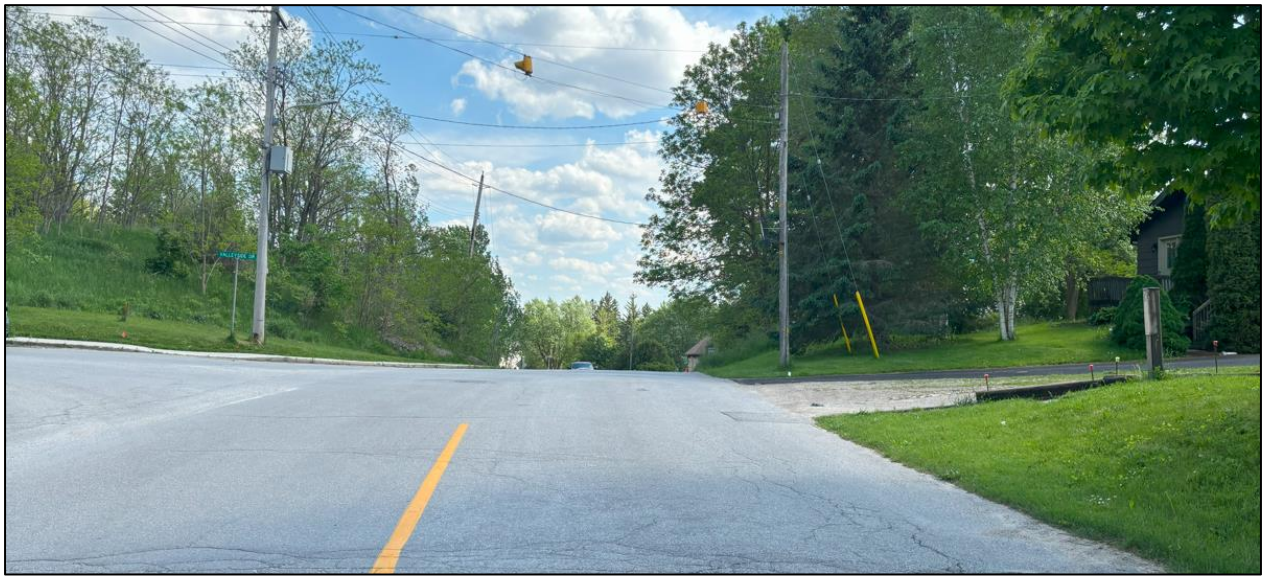

Figure 6: View of a southbound motorist approaching the new driveway – SSD (TNS, 2024).

2.1.3 Departure Sight Distance

From a typical stop location on the side street (i.e., from the new development driveway), a motorist needs sufficient sight distance along Yonge Street North to select a gap to turn onto the roadway without significantly impeding traffic flow. The departure sight distance (the 'DSD') triangles associated with a typical turning vehicle movement are shown in **Figure 7**.

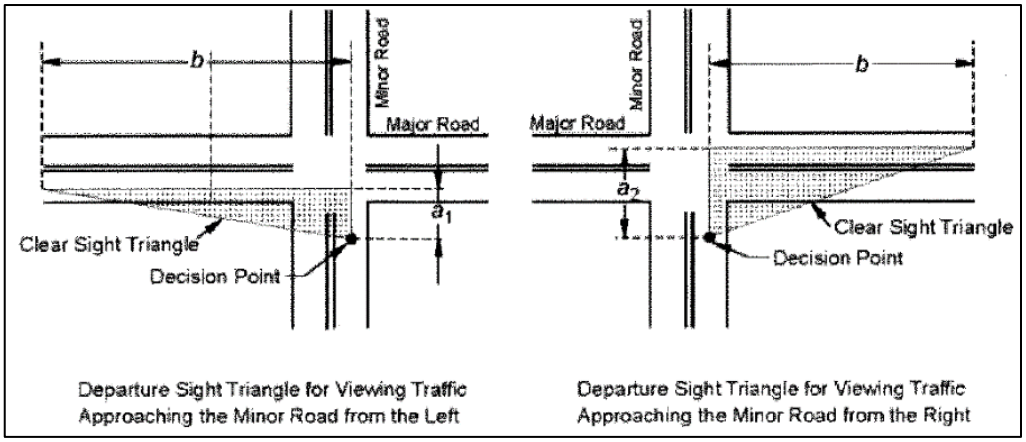

Figure 7: Departure sight triangles: stop controlled intersection (Figure 9.9.2 TAC, 2017).

The minimum required DSD at the new development intersection is 130 m. Based on our field measurements, the available DSDs for a motorist turning onto Yonge Street North are the following:

- 50 metres for observing traffic approaching from the left (**Figure 8**).
- More than 130 metres for observing traffic approaching from the right (**Figure 9**).

Figure 8: View of a motorist looking left from new driveway – Departure sight distance (TNS, 2024).

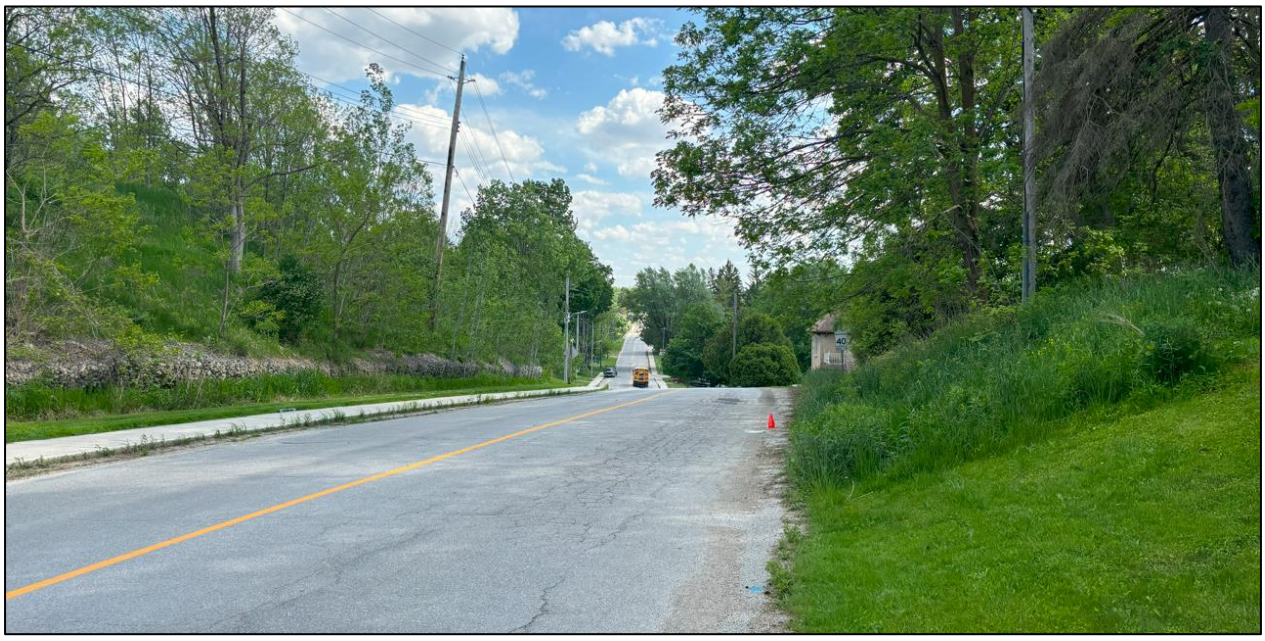

Figure 9: View of a motorist looking right from new driveway – Departure sight distance (TNS, 2024).

The available departure sight distance looking north of the new intersection falls below the minimum sight line requirements, and motorists turning onto Yonge Street North would have limited opportunities to observe other motorists approaching from their left. The limited visibility of approaching southbound motorists on Yonge Street North is primarily attributed to the presence of vegetation and a horizontal curve.

2.1.4 Approach Sight Distance

The approach sight distance is the sight triangle formed by the position of two opposing vehicles at a hypothetical location three seconds before they would impact each other, with the vehicles travelling at the prevailing speeds. At intersections with two public roadways, a fixed approach speed of 30 km/h on the side street is typically assumed to determine the required sight triangles. At a private driveway, operating speeds around 10 km/h are more representative of the site conditions. At 10 km/h, three seconds represents approximately 10 m of travel distance. The approach sight distance triangles are shown in **Figure 10**.

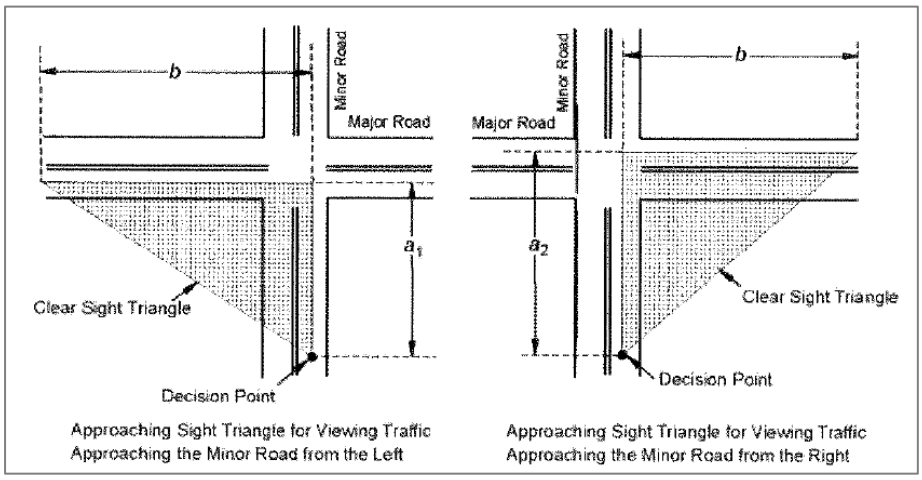

Figure 10: Approach sight triangles (Figure 9.9.1 TAC, 2017).

According to the TAC Guide, providing approach sight triangles at stop-controlled intersections is desirable but "may not be needed". The sight triangle should be clear of visual obstructions so that the vehicles can observe each other clearly within that triangle.

Therefore, at the new development intersection, the sight triangle visibility that should be maintained would be from a distance of 10 metres (new driveway) and 50 metres (Yonge Street North) back from the point of impact for the respective vehicles (centre of each lane).

Based on our field measurements, the available approach sight distances for a motorist turning onto Yonge Street North are the following:

- 30 metres for observing traffic approaching from the left (**Figure 11**).
- More than 50 metres for observing traffic approaching from the right (**Figure 12**).

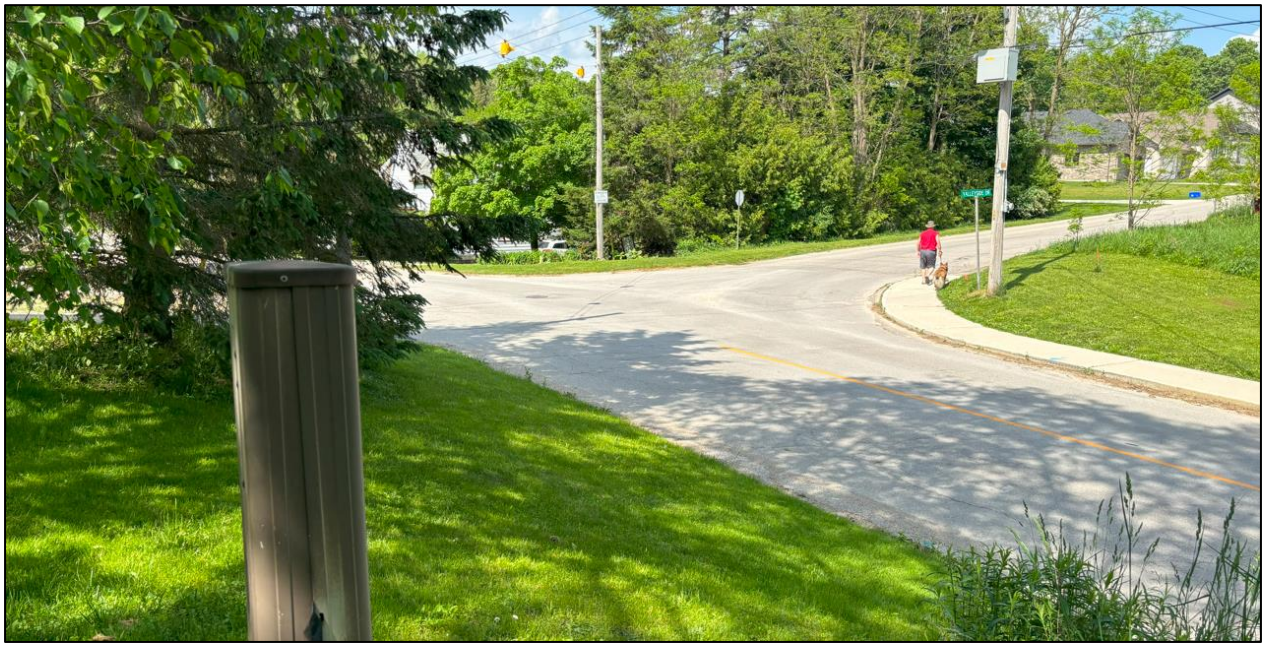

Figure 11: View of a motorist looking left from new driveway (10 m back) – Approach sight distance (TNS, 2024).

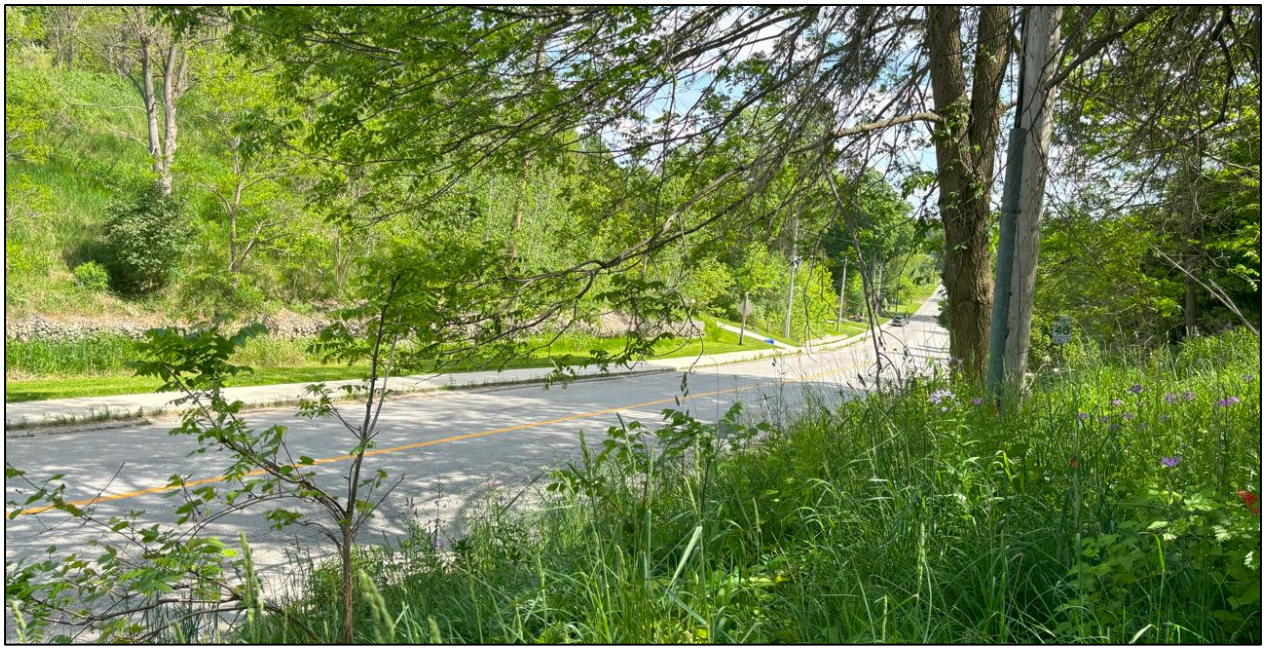

Figure 12: View of a motorist looking right from new driveway (10 m back) – Approach sight distance (TNS, 2024).

The available approach sight distance looking north of the new intersection falls below the minimum sight line requirements. The limited visibility of approaching southbound motorists on Yonge Street North is primarily attributed to the presence of vegetation and a horizontal curve. Additionally, the proposed retaining wall to be installed along the north property line of the new development may further restrict the available approach sight distance.

2.2 Pedestrian Facilities

The new townhouse development is expected to generate an increased amount of pedestrian activity, as well as create new desire lines crossing Yonge Street North. However, there is currently no sidewalk or controlled crossing connecting the development to Valleyside Drive, requiring pedestrians to cross Yonge Street North at an uncontrolled location with limited visibility.

2.3 Valleyside Drive

The adjacent intersection with Valleyside Drive also has limited sight lines. Specifically, the departure and approach sight lines at the southeast corner fall below minimum requirements. This means drivers turning onto Yonge Street North from Valleyside Drive have restricted visibility of northbound traffic. To mitigate this, a mirror has been installed on the west side of Yonge Street North to improve sight lines for approaching traffic. The limited visibility of approaching northbound motorists on Yonge Street North is primarily attributed to the presence of a vertical curve.

Figure 13 shows the limited visibility of northbound traffic from a stopped position on Valleyside Drive, along with the location of the mirror installed at the intersection.

Figure 13: View of a motorist looking left from Valleyside Drive – Departure sight distance (TNS, 2024).

In addition, the westbound STOP sign on Valleyside Drive is currently obstructed by vegetation, limiting the visibility of the STOP sign for approaching westbound motorists.

3.0 POTENTIAL REMEDIAL MEASURES

The proposed intersection is located on a roadway with limited visibility, which is primarily due to the presence of horizontal and vertical curves. Additionally, sight lines are restricted at the existing stop-controlled intersection of Yonge Street North with Valleyside Drive, located approximately 30 m north of the proposed development access. Since modifying the roadway alignment is not feasible, measures to effectively reduce traffic speeds on Yonge Street North approaching the new intersection should be implemented.

Two options were considered:

- Option 1: Convert the Valleyside Drive intersection to an all-way stop (AWS) controlled intersection.
- Option 2: Implement a combination of speed reduction measures on Yonge Street North approaching the new intersection.

An AWS intersection at Valleyside Drive is the preferred option. This option would address safety concerns at both the new intersection and the Valleyside Drive intersection, and significantly improve pedestrian safety within the study area.

3.1 Option 1 – AWS Conversion

This option involves installing STOP signs and pavement markings (stop bars) on all approaches at the intersection of Yonge Street North and Valleyside Drive. While traffic volumes and collision history may not meet the Ontario Traffic Manual (OTM) minimum volume or collision warrants for an all-way stop intersection, safety considerations can justify its implementation through the visibility warrant. The Ontario Traffic Manual Book 5[3] provides guidance on the implementation of AWS control at intersections. The warrants are based on the following:

- Minimum volume warrant: provides minimum vehicle volumes, minimum combined vehicle and pedestrian volumes, and permissible volume splits for major/minor roadways, based on roadway function.
- Collision warrant: provides minimum collision history, for collisions susceptible to improvement through AWS control, based on roadway function.
- Visibility warrant: at "*locations where visibility problems exist which limit the safe approach speed to less than 15 km/h, thereby creating an unreasonable accident potential*".

Based on the OTM guidance, the visibility warrant would apply for the intersection of Yonge Street North and Valleyside Drive. Currently, a mirror and flashing beacons have been installed on Yonge Street North to improve visibility and warn drivers of potential conflicts at Valleyside Drive. However, the mirror is a temporary solution, and a more permanent improvement should be implemented.

An AWS intersection would require all traffic to come to a complete stop, allowing drivers to safely judge gaps in traffic when turning in and out of Valleyside Drive. Given the proximity of the proposed driveway to the intersection, drivers turning in and out of the driveway would also

[3] Ontario Traffic Manual Book 5 – Regulatory Signs, 2000, Ontario Ministry of Transportation.

benefit from the reduced speeds of approaching motorists, who would be decelerating towards or accelerating from the AWS intersection. Additionally, reduced speeds on Yonge Street North would significantly enhance pedestrian safety and the AWS intersection would provide a controlled crossing for pedestrians crossing Yonge Street.

To improve the visibility of the STOP signs on Yonge Street, overhead red flashing beacons should be installed at the intersection. Additionally, STOP AHEAD warning signs should be placed on the northbound and southbound approaches to the intersection.

The Crash Modification Factor (CMF) for all types of collisions resulting in injuries when converting an intersection from minor stop-controlled operation to AWS is 0.3[4]. This means that installing AWS at the intersection has the potential to result in a 70% reduction of injury collision risk.

Figure 14 shows the signage for an AWS conversion at the intersection of Yonge Street North and Valleyside Drive. It should be noted that NEW signs (Wb-3) should be added above the STOP AHEAD warning signs for a duration of 30 to 60 days immediately after implementation, as recommended in OTM Book 6.

Figure 14: Signage for an AWS conversion at Yonge Street North and Valleyside Drive.

3.2 Option 2 - Combination of Speed Reduction Measures

This scenario considers the installation of a combination of speed reduction measures while maintaining the existing minor-stop controlled intersection at Valleyside Drive.

Radar speed signs are solar powered and use radar detection to display the speed of oncoming vehicles. They are used as a traffic calming measure, aimed to reduce vehicular speed by warning approaching motorists that they are exceeding the posted speed limit. The signs collect speed and volume data which can be utilized for further evaluation of intersection operations.

[4] Lovell, J. and Hauer, E., "The Safety Effect of Conversion to All-Way Stop Control." Transportation Research Record 1068, Washington, D.C., Transportation Research Board, National Research Council, (1986) pp. 103-107.

Centreline bollards are physical traffic calming measures that are installed vertically along the median of a roadway. Such bollards could be installed on Yonge Street North on the southbound approach to Valleyside Drive. They make the roadway appear to be narrower and more constricted, which encourages drivers to reduce their speed. According to the 2017 TAC Canadian Guide to Traffic Calming, centreline bollards may help decrease 85th percentile speeds up to 5 km/h. Note that maintenance considerations of these signs should be considered, and they would likely need to be removed during winter.

Figure 15 shows an example of each speed reduction measure.

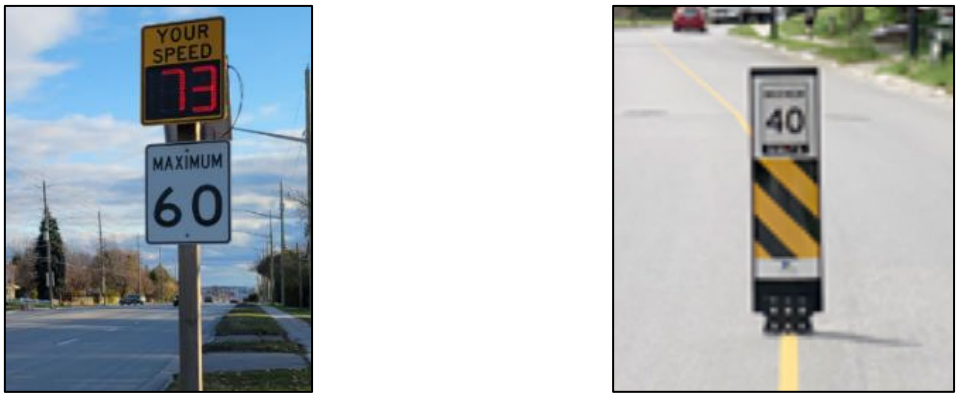

Figure 15: Radar speed sign (shown left); centreline bollard (shown right).

While this option may not eliminate the hazards, it would likely result in speed reductions and help mitigate the safety risks associated with the sightline issues at the intersections. However, note that under this scenario, pedestrians crossing Yonge Street North would still be required to cross at uncontrolled locations.

3.3 Additional Remedial Measures

Other remedial measures that could be considered at or near the new intersection include the following:

- Installation of a sidewalk on the west side of Yonge Street between the new driveway and Valleyside Drive.
- Installation of speed bumps on the new driveways to ensure that motorists approaching Yonge Street and exiting the property are travelling at low speeds.
- Vegetation trimming on the northwest corner of the new intersection to improve visibility of southbound motorists.

4.0 CONCLUSION

A new 30-unit townhouse development at 37 Yonge Street North is proposed. In response to the municipality's request, TNS was retained to complete a safety assessment to determine if the new driveway and existing intersection at Valleyside Drive, under its current configuration, can provide adequate safety levels. TNS was also requested to identify potential remedial measures to improve safety at the intersection.

The proposed intersection is located on a roadway with limited visibility, which is primarily due to the presence of a horizontal and vertical curves. Additionally, sight lines are restricted at the existing stop-controlled intersection of Yonge Street North with Valleyside Drive, located approximately 30 m north of the proposed development access. Since modifying the roadway alignment is not feasible, measures to effectively reduce traffic speeds on Yonge Street North approaching the new intersection should be implemented.

An AWS intersection at Valleyside Drive is the preferred option. This option would address safety concerns at both the new intersection and the Valleyside Drive intersection, and significantly improve pedestrian safety within the study area.

As an alternative, the installation of speed reduction measures on Yonge Street North, such as radar speed signs and centreline bollards, could be considered. However, under this scenario, pedestrians crossing Yonge Street North would still be required to cross at uncontrolled locations.

Other remedial measures that could be considered at or near the new intersection include the following:

- Installation of a sidewalk on the west side of Yonge Street North between the new driveway and Valleyside Drive.
- Installation of speed bumps on the new driveways to ensure that motorists approaching Yonge Street North and exiting the property are travelling at low speeds.
- Vegetation trimming on the northwest corner of the new intersection to improve visibility of southbound motorists.

Thank you for the opportunity to work on this project. Should you have any questions, please do not hesitate to contact us.

Sincerely,

True North Safety Group Incorporated

Alexandre Nolet, M.Eng., RSP$_1$, P.Eng.
Director of Transportation Safety and Forensics
[redacted]