

To: Gwen Zhang
City of Guelph
File: 1888 Gordon Street

From: Martin Kaczmarek
Stantec
Date: January 9, 2018

Reference: Response to City of Guelph Comments

INTRODUCTION

This memorandum was prepared to address comments received from City of Guelph staff on December 13, 2017 relating to the proposed residential development at the municipal address of 1888 Gordon Street. The comments received from staff requested analysis for sightlines at the proposed accesses on to Gordon Street and Poppy Drive, functional design for Gordon Street which include off-street bicycle and walking facilities and left-turn lane requirements, and traffic geometric plans showing the turning maneuvers for trucks circulating within the site and entering/exiting. The Study Area is illustrated in **Figure 1**.

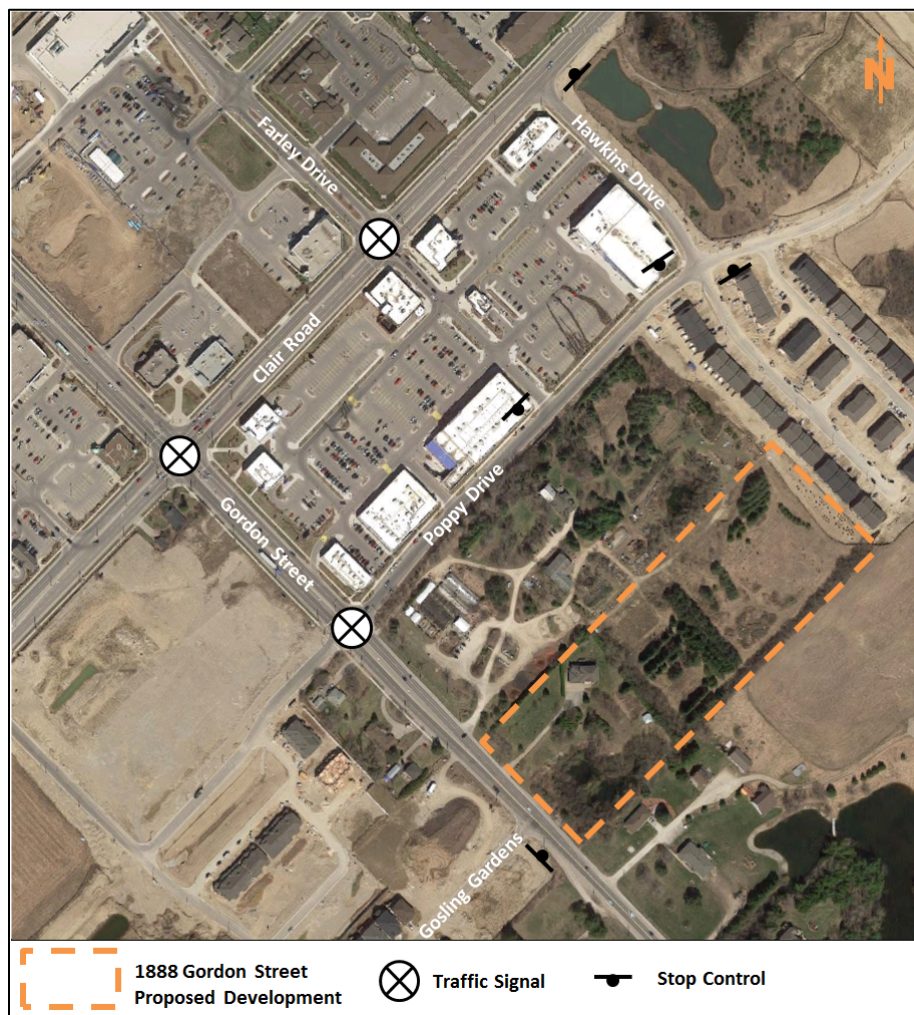


Figure 1 - Study Area

Reference: Response to City of Guelph Comments

SIGHTLINE ASSESSMENT

In this section, sight distance triangles are evaluated for crossing, left-turning, and right-turning movements at the intersections with the proposed accesses to assure that they meet the minimum requirements as outlined in *Figure 9.9.2: Departure Sight Triangles (Stop-Controlled)* of the Transportation Association of Canada's (TACs) *Geometric Design Guide for Canadian Roads, June 2017*. Evaluation of sight distance triangles at stop-controlled and signalized intersections is conducted differently due to the nature of the intersection control methods. Left-turning and right-turning departure sight triangles at stop-controlled intersections are determined using *TAC Equation 9.9.1*.

$$\text{Equation 9.9.1 } ISD = 0.278 * V_{major} * t_g$$

The time gap (t_g) is found from *TAC Table 9.9.3* for left-turning vehicles and *TAC Table 9.9.5* for right-turning vehicles. Adjustments are not required for the right turn on red movements at the Gordon Street access because the additional width of the roadway does not affect the travelled distance to complete the right turning movement. Using a design speed (V_{major}) of 90 km/h along Gordon Street, 20 km/h above the posted speed limit, and a time gap of 6.5 seconds from *TAC Table 9.9.5*, the required sight distance looking left for a right-turning movement on to Gordon Street is 165 metres. The required sight distance for vehicles turning right on to Poppy Drive from the proposed site accesses is determined using *TAC Equation 9.9.1* with a design speed of 60 km/h, 10 km/h above the statutory speed limit, which results in a distance of 110 metres.

Vehicles attempting to turn left at a signalized intersection must wait for an acceptable gap in the opposing flow, instead of in the flow of the intersecting roadway. Due to this, the sight distance of the left turning movement at signalized intersections is largely influenced by the location of the opposing left turn lane and the vehicles queued within it, and does not need to be assessed for sightlines along the conflicting roadway. Only the sight distance to the left is considered for departure sightlines at signalized intersections in the TAC methodology, therefore, the sight distance to the right of the Gordon Street access is not considered. Applying a time gap of 7.5 seconds from *TAC Table 9.9.3* to *TAC Equation 9.9.1*, it is determined that a sight distance of 130 metres is required in both directions for vehicles turning left on to Poppy Drive from the site accesses. Crossing sight distances are deemed to be provided in most cases through the left-turning and right-turning sight distance requirements. The subject intersections do not meet the special conditions for assessment of crossing sight distance, therefore, only the left and right turning distances are considered. The sight distance requirements are summarized in **Table 1** and **Table 2**.

Table 1 - Right-Turning Departure Sight Triangles

Intersection	Approach	Looking Towards	Required Distance	Requirement Met
Gordon Drive / Gosling Gardens	East	Left	165 m	Yes
Poppy Drive / West Access	South	Left	110 m	Yes
Poppy Drive / East Access	South	Left	110 m	Yes

Table 2 - Left-Turning Departure Sight Triangles

Intersection	Approach	Looking Towards	Required Distance	Requirement Met
Poppy Drive / West Access	South	Left	130 m	Yes
		Right	130 m	Yes
Poppy Drive / East Access	South	Left	130 m	Yes
		Right	130 m	Yes

Reference: Response to City of Guelph Comments

As shown in the preceding tables, the largest sight distance requirements are 165 metres looking towards the left for vehicles turning right on to Gordon Street, and 130 metres looking towards the left and right for turns on to Poppy Drive. The location of the proposed access on to Gordon Street, directly across from Gosling Gardens, has vegetation under existing conditions however it is expected that this will be cleared coincident with the progress of the proposed development. The vegetation should be cleared such that 165 metres of sight distance towards the left is made available to vehicles exiting from the Gordon Street access.

No obstructions to sightlines are observed towards the left and right from the accesses along Poppy Drive. It is noted that Poppy Drive curves towards the south east of Hawkins Drive which will result in the west approach's sight distance towards the right being limited due to a nearby residential building, however, all required sight distances are expected to be provided.

TURN LANE REQUIREMENTS

An assessment of the requirements for left turn lane storage lengths at the signalized intersection of Gordon Street with Gosling Gardens with 2030 forecast traffic volumes is undertaken below as per the GDSOH *Section B.7.8.5 – Length of Left Turn Storage Lane*. The approach outlined in the manual considers the cycle length at the signalized intersections and the equivalent number of passenger vehicles making left turn movements on the approach. Each heavy vehicle is converted to 2.0 passenger vehicles. After calculating the left turn arrival rate per cycle per lane, the number of vehicles which will arrive 95% of the time is found through *Table B7-5 – Vehicle Arrival Rates and Green Plus Amber Times for Urban/Commuter Intersections* and the required storage length is found through application of an average length of 7.5 metres for passenger vehicles. A cycle length of 90 seconds was assumed for the signalized intersection of Gordon Street with Gosling Gardens, matching the cycle lengths of the adjacent intersections. High heavy vehicle proportions are not expected to be turning southbound and northbound left at the intersection due to the residential nature of the developments, therefore a 2% heavy vehicle percentage was assumed. The required storage lengths for left turn lanes along Gordon Street are summarized in **Table 4**.

Table 3 - Minimum Auxiliary Left Turn Lane Storage Length Requirements

Intersection	Movement	AM Peak Hour		PM Peak Hour		Required Storage
Gordon Street / Gosling Gardens	NBL	#LT	6	#LT	18	15 m
		Cycle (s)	90	Cycle (s)	90	
		%HV	2%	%HV	2%	
		Equiv. #LT	6	Equiv. #LT	18	
		Arrival Rate	0.15	Arrival Rate	0.45	
		95% Arrival	1	95% Arrival	2	
		Queue	7.5	Queue	15	
Gordon Street / Gosling Gardens	SBL	#LT	34	#LT	100	37.5 m
		Cycle (s)	90	Cycle (s)	90	
		%HV	2%	%HV	2%	
		Equiv. #LT	35	Equiv. #LT	102	
		Arrival Rate	0.88	Arrival Rate	2.55	
		95% Arrival	3	95% Arrival	5	
		Queue	22.5	Queue	37.5	

It is generally recommended to provide approach taper lengths which will smoothly transition drivers into auxiliary left turn lanes. The approach taper length is dependent on the design speed of the roadway and can vary depending on whether

Reference: Response to City of Guelph Comments

urban conditions constrain the available length. TAC Table 2.3.8.1 - *Approach and Departure Taper Ratios and Lengths for Left Turns at Intersections* is referenced in the determination of the taper design domain. The lower end of the design domain may be used in cases where urban conditions constrain the available length. A lane width of 3.0 m is assumed along all left turn lanes. It is recommended to provide a taper length of 60 metres along the southbound left turn lane due to constrained distance to the north, and an 80 metre taper length along the northbound left turn lane.

Table 4 - Auxiliary Left Turn Lane Approach Taper Design Domains

Intersection	Design Speed	Taper Design Domain
Gordon Street / Gosling Gardens	90 km/h	27:1 – 54:1 (81 m – 162 m)

TRUCK TURNING MANEUVER PLANS

Truck turning maneuver plans are attached for reference. The plans show the entry, exit, and internal circulation turning maneuvers for fire trucks, garbage trucks, and WB-20 trucks at the proposed development.

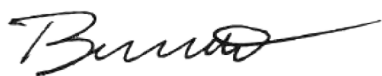
CONCLUSIONS AND RECOMMENDATIONS

The conclusions of this memorandum are as follows:

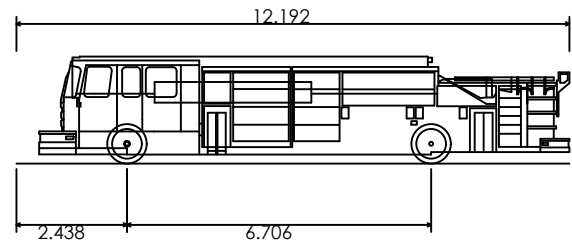
- Required sightlines at the proposed site accesses on to Gordon Street and Poppy Drive are provided.
- A minimum storage length of 15 metres along the northbound left, and a 37.5 metres along the southbound left movements are required at the intersection of Gordon Street with Gosling Gardens to accommodate forecast 2030 traffic volumes.
- A taper length of 81 metres is desired for the auxiliary left turn lanes, however, the distance to the adjacent storage length to the north is constrained.

The recommendations of this memorandum are as follows:

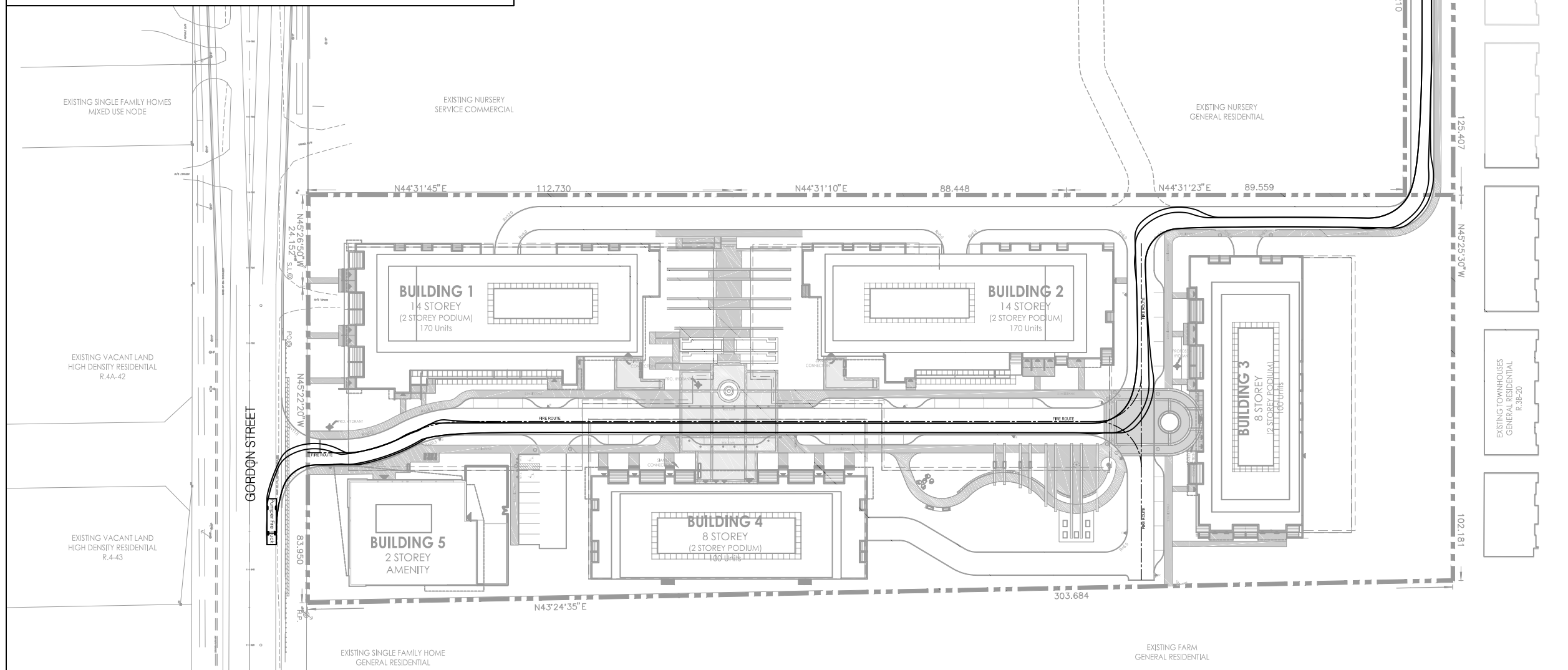
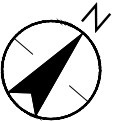
- Provide a minimum storage length of 15 metres for the northbound left turn lane, and 37.5 metres for the southbound left turn lane at Gordon Street / Gosling Gardens.
- Provide a taper of 60 metres for the southbound left and 80 metres for the northbound left turn lanes at Gordon Street / Gosling Gardens.

STANTEC CONSULTING LTD.**Martin B. Kaczmarek, EIT**
Transportation DesignerPhone: (416) 507-3443
martin.kaczmarek@stantec.comAttachment: Gordon Street Lane Configuration
Truck Turning Maneuver Plansc. Chris Hendriksen
Francois Tomeo

\\CD\217401\work_group\01614\active\161401285 - Brock Road, Guelph\design\drawing\Planning\Figures\161401285_R-SP-FireTruckAccess.dwg
2017-12-21 1:41 PM by: Brown, Alexander



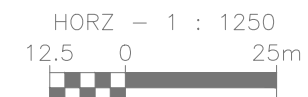
Pumper Fire Truck	
Overall Length	12.192m
Overall Width	2.438m
Overall Body Height	6.706m
Min Body Ground Clearance	0.200m
Track Width	2.489m
Lock-to-lock time	5.00s
Max Wheel Angle	45.00°



December, 2017
161401285



600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com



Client/Project
Tricar Developments Inc.
1888 Gordon Street
Guelph, ON Canada

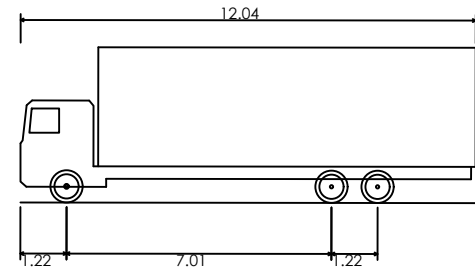
Figure No.

2.0

Title

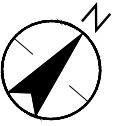
Fire Truck Turning Radius
December 21, 2017

\\CD\217F01\work_group\01614\active\161401285 - Brock Road, Guelph\design\drawing\Planning\Figures\161401285_R-SP-Garbage.dwg
2017-12-21 1:43 PM by: Brown, Alexander



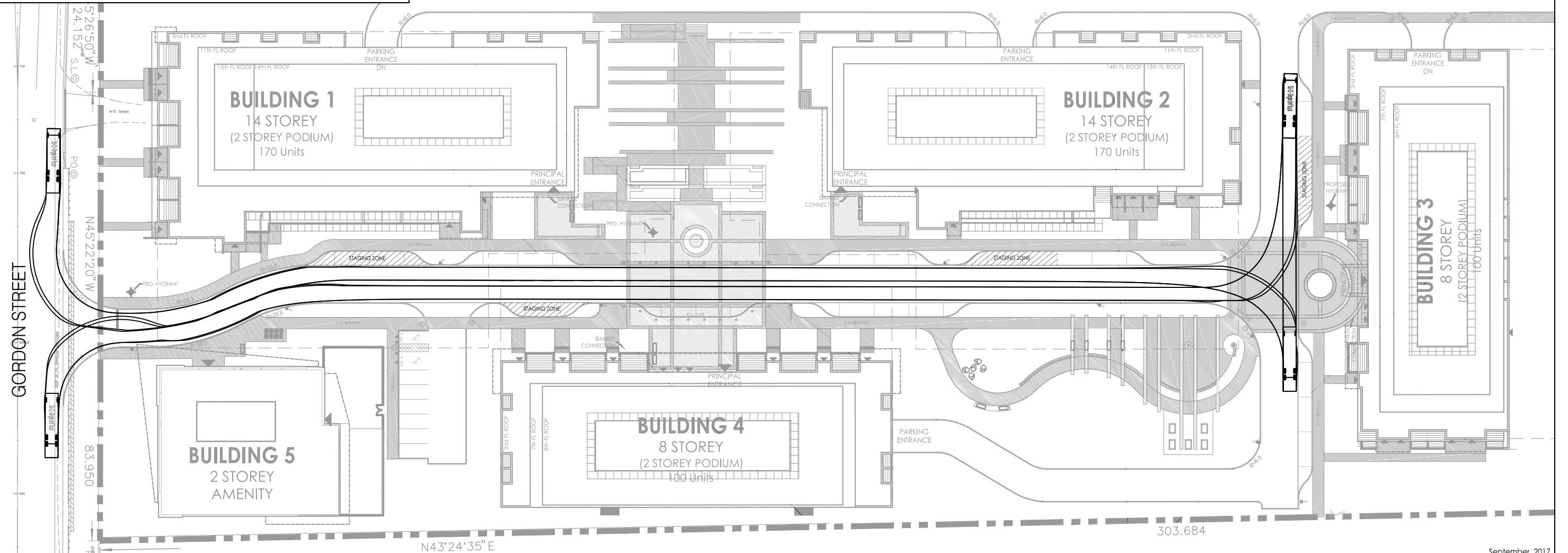
SU-12 - Single Unit Truck
Overall Length
Overall Width
Overall Body Height
Track Width
Lock-to-lock time
Curb to Curb Turning Radius

12.040m
2.440m
4.110m
2.440m
5.0 sec
15.600m



EXISTING NURSERY
GENERAL RESIDENTIAL

112.730 N44°31'10"E 88.448 N44°31'23"E 89.559



September, 2017
161401285



600-171 Queens Avenue
London ON N6A 5J7
Tel. 519-645-2007
www.stantec.com

HORZ - 1 : 750
7.5 0 15m

Client/Project
Tricar Developments Inc.
1888 Gordon Street
Guelph, ON Canada

Figure No.

1.0

Title

Waste Management Plan
Garbage Truck Turning Radius
December 21, 2017

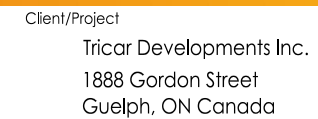
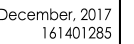


Figure No.

1.0

Title

Truck Turning
WB20 Transport Truck
December 21, 2017