Appendix C

Geometric Review

101-17262

April 30, 2012

Mr. Neal Smith, C.E.T.
Project Manager
Peel Region
10 Peel Centre Drive, Suite B
4th Floor
Brampton, ON L6T 4B9

Re: Class Environmental Assessment for Mayfield Road from Chinguacousy Road to Heart Lake Road (Project #10-4350)
Geometric Review Report

Dear Mr. Smith:

Attached please find the Geometric Review Report for the Class Environmental Assessment for Mayfield Road from Chinguacousy Road to Heart Lake Road as per the requirements of RFP #10-4350.

The Geometric Review Report documents the existing geometrics of Mayfield Road.

Should you have any questions, please feel free to contact either of the undersigned.

Yours truly,

GENIVAR Inc.

Bruce Grundon, B.Tech.
Project Manager

2800 Fourteenth Avenue, Suite 210, Markham, Ontario L3R 0E4
Telephone: 905.946.8900 • Fax: 905.946.8966 • www.genivar.com

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1. Introduction

The Regional Municipality of Peel (Peel Region) has initiated a Class Environmental Assessment (EA) Study for Mayfield Road, from Chinguacousy Road to Heart Lake Road, in order to address road network needs and accommodate growth in the area.

GENIVAR was retained by Peel Region to undertake the study.

2. Purpose of the Report

As an initial step of the study, existing geometrics along Mayfield Street within the Study Area were assessed to identify locations of non-conformance with current Peel Region design standards.

This report documents the results of the geometric assessment.

The deficiencies identified in this report will be considered when generating potential design alternatives within the corridor during this EA Study.

3. Geometric Review

Mayfield Road has a posted speed of 80 km/h between Chinguacousy Road to 305 m west of Hurontario Street, and 610 m east of Hurontario Street to Heart Lake Road. Mayfield Road between 305 m west of Hurontario Street and 610 m east of Hurontario Street has a posted speed of 60 km/h.

Design speeds of 70 km/h (where posted speeds are 60km/h) or 90 km/h (where posted speeds are 80km/h) were utilized as the basis for the geometric review of Mayfield Road.

Mayfield road is classified as a *Major Road* by the Region of Peel's Official Plan (November 2005). It is to be designed to carry high volumes of traffic between significant activity nodes. The classification of a *Major Road* by the Region of Peel is similar to the classification of a Major Arterial by the Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads (1999)

The geometric review undertaken included the following components:

- Horizontal Alignment;
- Vertical Alignment;
- Cross Section; and
- Intersections.

The following sections summarize the review of each component.

3.1 Information Used for the Review

The following information was used to identify horizontal and vertical alignments, cross section widths and intersection configurations and sight distances.

- Photomapping undertaken by Northway Photomap, dated March 2011; and
- The TAC Geometric Design Guide for Canadian Roads (1999);

For the purposes of the review, a horizontal alignment was developed using the crown of the existing roadways as a reference to create an existing centreline alignment.

3.2 Horizontal Alignment

In accordance with Section 2.1.2.6 of the TAC Manual, horizontal curves should be provided when deflection angles exceed 0°30'. The minimum radius for a design speed of 80 km/h is 250 m, and for 100 km/h is 440 m, as shown in Table 2.1.2.6 of the TAC Manual.

The desirable curve length on rural roads and intermediate class urban roads, horizontal curves should be at least 150 m for curve angles greater than 5°, increasing by 30m for every 1° decrease. A minimum length of horizontal curve should be three (3) times the design speed (in m/s). **Table 3-1** summarizes the results of the horizontal alignment review.

There are two sets of broken back curves within the study limits located between STAs 11+720 – 12+440 and STAs 14+920 – 15+500. While it is generally not desirable to use broken back curves they can be accommodated if a spiral curve is used to connect them. However, for ease of construction tangent lengths can be used, if they provide a driver with enough sight distance to see the change in curvature. In the cases of the broken back curves within the study limits the curves at STA 11+720 – 12+440 are separated by 50m. At STA 14+920 – 15+500 the curves are separated by 100m. Due to the large radii at each set of curves, sufficient sight distance is available.

Since all existing radii are large (with the exception of the curves at STA 15+042 and STA 15+377), the length of curve does not cause a reduction in safety when considering the stopping or decision sight distance. Therefore, at stations where the length of the horizontal curve is substandard, the exceptionally large radius creates an almost flat and unnoticeable change in the alignment.

Table 3-1 - Summary of Horizontal Curve Review on Mayfield Road

PI Station	Existing Radius	Actual Length of Curve	Delta Angle	Design Speed	Desirable Length of Curve	Minimum Length of Curve	Meet or Exceeds Minimum Standard
	(m)	(m)	D°M'S"	(m/s)	(m)	(m)	(yes/no)
10+638.591	R-5000	153.554	1°45'35"	25	250	75	Yes
10+904.429	R-5000	133.813	1°32'00"	25	260	75	Yes
11+918.848	R-5000	383.983	4°24'00"	25	170	75	Yes
12+304.357	R-5000	284.781	4°04'45"	19	180	57	Yes
13+413.176	R-5000	89.699	3°25'35"	19	200	57	Yes
13+685.157	R-5000	77.196	2°56'55"	25	220	75	Yes
14+201.233	R-5000	169.264	1°56'23"	25	250	75	Yes
14+419.150	R-5000	**28.485**	1°21'36"	25	260	75	No
15+042.002	R-1200	245.229	11°42'32"	25	150	75	Yes
15+377.304	R-1200	240.614	11°29'19"	25	150	75	Yes

Note: Bolded values do not meet the minimum desirable standards

3.3 Vertical Alignment

A maximum road grade of 5% is acceptable for design speeds of 90 km/h and higher (TAC Page 2.1.3.3). For the design speed of 70km/h a maximum road grade of 6% is acceptable. Road grades should not fall below 0.5% to ensure positive drainage of the roadway. However, in retrofit areas, the minimum grade can be lowered if adequate drainage is provided.

The minimum K-values for crest and sag vertical curves as identified in Table 2.1.3.2, 2.1.3.3 and 2.1.3.4 of the TAC were used for the vertical alignment assessment. For design speed of 80 km/h, the K-values ranges from 24-36 m for crest curves (for stopping sight distance), and 30-40 m for sag curves (for headlight control).

For the design speed of 90 km/h, K-values range from 32-53 m for crest curves (for stopping sight distance), and 30-40 m for sag curves (for headlight control).

There are eight (8) vertical curves within the Study Area. Four (4) are crest curves and four (4) are sag curves. As long as the K-Values are met, or exceeded, the length of the curve can be less than the stopping sight distance. All curves within the Study Area exceed the required design K-values.

Table 3-2 summarizes the results of the vertical alignment review.

While maximum grades are not exceeded, minimum grades have not been achieved. However, Mayfield Road has not shown any signs of distress as a result of poor drainage.

Table 3-2 - Summary of Vertical Curves on Mayfield Road within Study Limits

Station VPI	Vertical Curve Type (crest/sag)	Approximate Length of Vertical Curve (m)	K-Value	Design Speed (km/h)	Meets or Exceeds Minimum Standard (yes/no)
Entrance Grade: -0.03%					
10+430.115	Sag	11	± 45	90	Yes
Exit Grade: 0.25%					
Entrance Grade: 0.25%					
11+080.158	Crest	23	± 70	90	Yes
Exit Grade: -0.24%					
Entrance Grade: -0.24%					
13+278.856	Crest	105	± 35	70	Yes
Exit Grade: -3.23%					
Entrance Grade: -3.23%					
13+567.788	Sag	306	± 40	70	Yes
Exit Grade: 4.40%					
Entrance Grade: 4.40%					
13+922.906	Crest	282	± 60	70	Yes
Exit Grade: -0.29%					
Entrance Grade: -0.29%					
14+507.340	Sag	205	± 40	70	Yes
Exit Grade: 4.84%					

Station VPI	Vertical Curve Type (crest/sag)	Approximate Length of Vertical Curve (m)	K-Value	Design Speed (km/h)	Meets or Exceeds Minimum Standard (yes/no)
Entrance Grade:	4.84%				
14+852.848	Crest	485	± 60	70	Yes
Exit Grade:	-3.24%				
Entrance Grade:	-3.24%				
15+212.897	Sag	183	± 55	70	Yes
Exit Grade:	0.07%				

Note: Bolded values do not meet the minimum desirable standards

3.4 Cross Sections

Mayfield Road between Chinguacousy Road and 160 m west of Hurontario Street is generally a 2-lane rural section with turning lanes at selected intersections. From 160 m west of Hurontario Street to 330 m west of Heart Lake Road, Mayfield Road is an urbanized 4-lane section with turning lanes at selected intersections. The last 330 m of Mayfield Road, up to Heart Lake Road intersection, is a 6-lane urban section with turning lanes.

The through lane widths vary from 3.2 m to 4.1 m and generally do meet TAC standards for minimum lane width of 3.75 m of a major arterial (TAC Table 2.2.2.3).

Currently, there are exclusive left turn lanes at ten (10) intersections:

- McLaughlin Road;
- Van Kirk Drive;
- Cresthaven Road/Robertson Davies Drive;
- Hurontario Street;
- Colonel Bertram Road;
- Summer Valley Drive;
- Inder Heights Drive;
- Kennedy Road;
- Stonegate Drive; and
- Heart Lake Road.

In addition, there are exclusive right turn lanes at six (6) intersections:

- Van Kirk Drive
- Cresthaven Road/Robertson Davies Drive;
- Hurontario Street;
- Colonel Bertram Road;
- Kennedy Road; and
- Heart Lake Road.

The right and left-turn lane widths were compared to section 2.2.3.2 of the TAC.

All of the left turn lanes along Mayfield Road within the project limits meet the minimum width of 3.3 m or more when not adjacent to a raised median and at least 3.0 m when adjacent to a raised median.

The southbound right turn lane at Van Kirk Drive intersection is currently 3.1 m and the northbound right turn lane at Hurontario Street intersection is only 3.0 m. Both right turn lanes are not in conformance with the standard lane width as indicated in TAC Geometric Design

Guide for a turn lanes. Right-turn lanes are to be no more than 0.2m than through lanes but not less than 3.3m. However, left-turn lanes if adjacent to raised medians can be as narrow as 3.0m, unless they are dual or triple left-turn lanes,

For the rural sections along Mayfield Road, shoulders widths measured between 2.5-4.0m. This range of shoulder widths is acceptable, as existing shoulders erode over time and a minimum or 3.0 is usually designed for high volume roadways as per section 2.2.4.2.

3.4.1 Superelevation and Cross-Fall

For urban high volume, arterial roadways a maximum superelevation rate of 6% is utilized. The introduction of spiral curves is reserved for major arterials, expressways and freeways where the design speed is 70 km/h or greater. Superelevation is generally used to aid drivers through a circular or spiral curve. When a vehicle enters a circular curve it experiences a radial acceleration towards the centre of the curve. This in turn causes a centripetal force on the vehicle pushing it towards the outside of the curve. Using the weight of the car to counteract this, a superelevated section is introduced. However, if the horizontal curve is of sufficient size (large radius) then superelevation may not be required. Since the majority of the curves along Mayfield road are greater than 4000m, no superelevation is required (TAC Table 2.1.2.6)

At STA 15+042 and STA 15+377 the radii are both 1200m. For the design speed of 90km/h the superelevation rate should be 3.4%. The superelevation was measured between 2-2.5%.

Normal cross-fall along tangent sections of roadway should be 2%. Along Mayfield road, with the exception of intersections and superelevated sections, all tangent sections meet this requirement.

3.5 Intersections

At intersections, consideration of storage length, parallel lane length and taper lengths must be considered when exclusive turn lanes are introduced. The storage length is a calculated value based on forecast traffic volumes. Parallel and taper lengths are calculated based on the design speed of the roadway. Parallel and taper lengths must be of sufficient length to accommodate the stopping sight distance. This value is exclusive of the storage length requirements. Since the original storage length design calculations were not available, a minimum 15 m storage length was used, the remaining length would be considered parallel lane.

There are a total of eight (8) signalized and four (4) unsignalized intersections within this section of Mayfield Road. The following attributes of each intersection are listed in the following sections:

- Turning Sight Distance – Sight distance required for a driver to safely see an approaching vehicle and to complete the turning manoeuvre (these values are calculated using Figure 2.3.3.4 of the TAC Manual). The height of the approaching vehicle was set at 1.30m (Table 1.2.5.1)
- Intersection Configuration – existing number of approaches at each intersection (i.e. T-Intersection or Cross-Intersection)

- Intersection Skew Angle – Angle between intersecting roads. Should be no more than 20° from 90° (measured as 70° or 110°). Intersection skew angles greater than 20° from 90° are considered unsafe.
- Right-Turn Taper and Parallel Lane Lengths – using the minimum standard values shown in Table 2.3.5.1 of the TAC Manual, the length of parallel and taper lanes will be assessed.
- Left-Turn Deceleration Lengths – Parallel lanes are sometimes not included in built-up or urban areas due to physical constraints such as property or intersections spacing. Therefore, the taper may be used for deceleration requirements. Therefore, the taper and parallel lane must be of sufficient length such that the stopping sight distance can be accommodated. Table 1.2.5.3 of the TAC provides these values.

For a design speed of 50 km/h, the minimum left-turn taper length is 30 m and the deceleration length is 60 m. The minimum right turn parallel and taper lengths are 35 m and 39 m, respectively.

For a design speed of 70 km/h, the minimum left-turn bay taper length and approach taper length are 35 m and 53 m respectively. The deceleration Length is 95m. The minimum right turn parallel and taper lengths are 50 m and 60 m, respectively.

For a design speed of 80 km/h, the minimum left-turn taper length is 53 m and the deceleration length is 115m. The minimum right turn parallel and taper lengths are 60 m and 60 m, respectively.

For a design speed of 90 km/h, the minimum left-turn bay taper length and approach taper length are 46 m and 95m respectively. The deceleration Length is 130m. The minimum right turn parallel and taper lengths are 60 m and 85 m, respectively.

The right-turning sight distances, Figure 2.3.3.4 (Line Cb) of the TAC Geometric Design Guide for Canadian Roads was utilized for this review. The minimum desirable length is 200 m for a design speed of 70 km/h, 247 m for design speed of 80 km/h, and 305 m for a design speed of 90 km/h.

For the left-turning sight distances, Figure 2.3.3.4 (Lines B-1 and B-2b) of the TAC Geometric Design Guide for Canadian Roads was utilized for this review.

Based on a design speed of 70 km/h, the minimum desirable lengths are 140 m (Line B-1) and 200 m (Line B-2b) for vehicles approaching from the left and right of the intersection, respectively.

The minimum desirable lengths are 165 m (Line B-1) and 305 m (Line B-2b) for vehicles approaching from the left and right of the intersection, respectively, based on a design speed of 90 km/h.

3.5.1 Signalized Intersections

While taper lengths may be of sufficient length, deceleration lengths at all signalized intersections are of insufficient in length with the exception of the west and north approach at Hurontario Street, the west and north approach at Summer Valley Drive, the east approach at Kennedy Road, and all approaches at Heart Lake Road.

Only right-turning sight distances were reviewed at signalized intersections. Since vehicles are permitted to turn on a red light, this review will determine if sufficient sight distance is available for vehicles to safely complete the turning manoeuvre.

Only the north approach at Summer Valley Drive lacked sufficient sight distance. A tree is located within the required sight triangle. However, a proper sight triangle at this intersection has not been obtained and the tree is on private property. Obtaining additional property for a sight triangle should be undertaken. However, the sight line can also be improved without additional property requirements if the stop bar is moved closer to the intersection.

Table 3-3 and **Table 3-4** on the following pages summarize the findings of the current signalized intersection configurations within the study limits.

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Table 3-3 - Summary of Signalized Intersection Configuration

Lane Type (Left / Through / Right)	No. of Lanes (#)	Parallel Lane Length (m)	Taper Length (m)	Design Speed (km/h)	No. of Lanes (#)	Parallel Lane Length (m)	Taper Length (m)	Design Speed (km/h)
Chinguacousy Road (10+060)						**Intersection Angle:**	**79.0°**	
	West Approach			90	East Approach			90
Left-Turn Lane	0	-	-		0	-	-	
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		0	-	-	
	North Approach			80	South Approach			80
Left-Turn Lane	0	-	-		0	-	-	
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		0	-	-	
McLaughlin Road (11+454)						**Intersection Angle:**	**82.1°**	
	West Approach			90	East Approach			90
Left-Turn Lane	1	**15****	**85**		1	**70****	80	
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		0	-	-	
	North Approach			80	South Approach			80
Left-Turn Lane	0	-	-		0	-	-	
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		1	**10****	**55**	
Cresthaven Road / Robertson Davies Drive (12+362 / 12+365)						**Intersection Angle:**	**79.4° / 81.4°**	
	West Approach			90	East Approach			90
Left-Turn Lane	1	**15****	105		1	**15****	115	
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	1	**10**	**65**		1	**15**	**80**	
	North Approach			60	South Approach			60
Left-Turn Lane	1	**15****	**40**		1	**20****	**45**	
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		0	-	-	
Hurontario Street (12+834)						**Intersection Angle:**	**81.9°**	
	West Approach			70	East Approach			70
Left-Turn Lane	1	60	65		2	**35****	**50**	
Through Lane	2	-	-		2	-	-	
Right-Turn Lane	1	85	80		1	**40**	70	
	North Approach			80	South Approach			80
Left-Turn Lane	1	60	65		1	**30****	**30**	
Through Lane	2	-	-		2	-	-	
Right-Turn Lane	1	**60**	80		1	**45**	**70**	

Lane Type (Left / Through / Right)	No. of Lanes (#)	Parallel Lane Length (m)	Taper Length (m)	Design Speed (km/h)	No. of Lanes (#)	Parallel Lane Length (m)	Taper Length (m)	Design Speed (km/h)
Colonel Bertram Road (13+005) (T-Intersection)						**Intersection Angle:**	**84.7°**	
	West Approach				East Approach			
Left-Turn Lane	1	**15****	**50**	70	1	**50****	**50**	70
Through Lane	2	-	-		2	-	-	
Right-Turn Lane	1	115	0		1	**5**	**50**	
	North Approach				South Approach			
Left-Turn Lane	0	-	-	N/A	1	**5**	**25**	40
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		0	-	-	
Summer Valley Drive (13+207) (T-Intersection)						**Intersection Angle:**	**90.4°**	
	West Approach				East Approach			
Left-Turn Lane	1	50	50	70	0	-	-	70
Through Lane	2	-	-		2	-	-	
Right-Turn Lane	0	-	-		0	-	-	
	North Approach				South Approach			
Left-Turn Lane	1	15	50	40	0	-	-	N/A
Through Lane	0	-	-		0	-	-	
Right-Turn Lane	1	*	*		0	-	-	
Kennedy Road (14+222)						**Intersection Angle:**	**74.6°**	
	West Approach				East Approach			
Left-Turn Lane	1	**10****	60	70	1	20	110	70
Through Lane	1	-	-		2	-	-	
Right-Turn Lane	1	*	*		0	-	-	
	North Approach				South Approach			
Left-Turn Lane	1	**45****	55	70	1	**45****	55	70
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		1	*	*	
Heart Lake Road (15+588)						**Intersection Angle:**	**85.0°**	
	West Approach				East Approach			
Left-Turn Lane	1	115	165	90	1	155	**65**	90
Through Lane	3	-	-		3	-	-	
Right-Turn Lane	1	175	90		1	155	**65**	
	North Approach				South Approach			
Left-Turn Lane	1	20	165	90	1	105	**75**	80
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	1	**20**	110		1	**40**	**65**	

Notes: Bolded values do not meet the minimum standards.
* Through lane is dropped at the intersection
** Insufficient deceleration length

Table 3-4 - Summary of Sight Distance Review at Signalized Intersections for Right Turning Vehicles

Intersection	Approach	Required Turn Sight Distance (m)	Actual Turn Sight Distance (m)	Meet Minimum Desirable Standard?	Notes
Chinguacousy Road	North	305	>305	Yes	
	South	305	>305	Yes	
McLaughlin Road	North	305	>305	Yes	
	South	305	>305	Yes	
Cresthaven Road / Robertson Davies Drive	North	305	>305	Yes	
	South	305	>305	Yes	
Hurontario Street	North	200	>250	Yes	
	South	200	>250	Yes	
Colonel Bertram Drive	North	200	>250	Yes	
	South	200	>250	Yes	
Summer Valley Drive	North	200	**146**	No	Tree obstructing view
Kennedy Road	North	305	**290**	No	Intersection is far from crest curve (STA 13+922). However, it is still impacted as it is on the downside of the tangent.
	South	305	>305	Yes	
Heart Lake Road	North*	305			
	South	305	>305	Yes	

Note: Bolded values do not meet the minimum standards.
*approaching sight line is beyond project limits.

3.5.2 Un-signalized Intersections

Table 3-5, **Table 3-6**, and **Table 3-7** on the following pages summarize the findings of the current unsignalized intersection configurations within the study limits.

While taper lengths may be of sufficient length, deceleration lengths at all unsignalized intersections are of insufficient in length with the exception of Valley View Intersection.

Both left and right-turning sight distances were reviewed for approaches which were stop controlled. Uncontrolled approaches were not reviewed. All of the intersections met or exceeded the right-turning sight distance, with the exception of Valley View Road. Only Van Kirk Drive met the requirements for left-turning sight distances.

A minor sub-standard crest vertical curve at STA 13+278 causes a minor reduction of sightlines at Valley View Road.

The intersection at Stonegate Drive is on a crest vertical curve. Therefore, sight lines will be restricted

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Table 3-5 - Summary of Unsignalized Intersection Configurations

Lane Type (Left / Through / Right)	No. of Lanes (#)	Parallel Lane Length (m)	Taper Length (m)	Design Speed (km/h)	No. of Lanes (#)	Parallel Lane Length (m)	Taper Length (m)	Design Speed (km/h)
Van Kirk Drive (11+782) (T-Intersection)						**Intersection Angle:**	**87.6°**	
	West Approach				East Approach			
Left-Turn Lane	0	-	-	90	1	20	175	90
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	1	**15****	110		0	-	-	
	North Approach				South Approach			
Left-Turn Lane	0	-	-	40	1	*	*	40
Through Lane	0	-	-		0	-	-	
Right-Turn Lane	0	-	-		1	-	-	
Valley View Road (13+355) (T-Intersection)						**Intersection Angle:**	**79.0°**	
	West Approach				East Approach			
Left-Turn Lane	0	-	-	90	0	**-**	-	90
Through Lane	2	-	-		2	-	-	
Right-Turn Lane	0	-	**-**		0	-	-	
	North Approach				South Approach			
Left-Turn Lane	0	-	-	40	0	-	-	40
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		0	-	-	
Inder Heights Drive (13+813) (T-Intersection)						**Intersection Angle:**	**79.0°**	
	West Approach				East Approach			
Left-Turn Lane	0	-	-	70	1	**15****	75	8070
Through Lane	2	-	-		2	-	-	
Right-Turn Lane	0	-	**-**		0	-	-	
	North Approach				South Approach			
Left-Turn Lane	0	-	-	40	0	-	-	40
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		0	-	-	
Stonegate Drive (14+756) (T-Intersection)						**Intersection Angle:**	**79.0°**	
	West Approach				East Approach			
Left-Turn Lane	0	-	-	90	1	**15****	115	90
Through Lane	2	-	-		2	-	-	
Right-Turn Lane	0	-	**-**		0	-	-	
	North Approach				South Approach			
Left-Turn Lane	0	-	-	40	0	-	-	40
Through Lane	1	-	-		1	-	-	
Right-Turn Lane	0	-	-		0	-	-	

Notes: Bolded values do not meet the minimum standards.
** Insufficient deceleration length

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Table 3-6 - Summary of Sight Distance Review at Unsignalized Intersections for Right-Turning Vehicles

Intersection	Approach	Required Turn Sight Distance (m)	Actual Turn Sight Distance (m)	Meet Minimum Desirable Standard	Notes
Van Kirk Drive	South	305	>305	Yes	
Valley View Road	South	200	220	Yes	
Inder Heights Drive	South	305	>305	Yes	
Stonegate Drive	South	305	>305	Yes	

Note: Bolded values do not meet the minimum standards.

Table 3-7 - Summary of Sight Distance Review at Unsignalized Intersections for Left-Turning Vehicles

Intersection	Approaching Vehicle	Required Turn Sight Distance (m)	Actual Turn Sight Distance (m)	Meet Minimum Desirable Standard?	Notes
Van Kirk Drive	Right	305	>305	Yes	
	Left	305	>305	Yes	
Valley View Road	Right	200	220	Yes	
	Left	200	>200	Yes	
Inder Heights Drive	Right	305	>305	Yes	
	Left	305	**249**	No	
Stonegate Drive	Right	305	>305	Yes	
	Left	305	**240**	No	Intersection is on the vertical curve (STA 14+852).

Note: Bolded values do not meet the minimum standards.

4. Summary

Within the study limits, the following deficiencies were found:

- Superelevation at STA 15+042 and STA 15+377 was found to range between 2- 2.5%, for the design speed of 100km/h the rate of superelevation should be 3.4%.
- Deceleration length requirements for exclusive turn lanes at the following signalized intersections are not met:
    - All approaches at McLaughlin Road
    - All approaches at Cresthaven Road / Roberston Davies Drive
    - East, south, and north approaches at Hurontario Street
    - All approaches at Colonel Bertram Road
    - West, north and south approaches at Kennedy Road
    - North and south approaches at Heart Lake Road

- Deceleration length requirements for exclusive turn lanes at the following unsignalized intersections are not met:
    - West approach at Van Kirk Drive
    - East Approach at Inder Heights Drive
    - East Approach at Stonegate Drive
- Sightlines at the following intersections are restricted:
    - Summer Valley Road
    - Valley View Drive
    - Stonegate Drive and
    - Kennedy Road

5. Closing

This report summarizes the existing geometrics along Mayfield Road, from Chinguacousy Road to Heart Lake Road. Opportunities exist to upgrade the existing roadway geometrics.

Appendix A

Horizontal Alignment Information

Project Name: Mayfield
Description: Horizontal Alignment
Name: Mayfield
Description:
Style: Default

	STATION	NORTHING	EASTING
Element: Linear			
POB	10+000.000	4840717.9450	592915.3787
BC	10+561.807	4841159.6836	593262.5021
Tangent Direction:	N 38^09'38.44" E		
Tangent Length:	561.807		

	STATION	NORTHING	EASTING
Element: Circular			
BC	10+561.807	4841159.6836	593262.5021
PI	10+638.591	4841220.0567	593309.9440
CC		4844249.0281	589331.0965
EC	10+715.362	4841281.8582	593355.5098
Radius:	5000.000		
Delta:	1^45'34.57" Left		
Degree of Curvature(Arc):	1^08'45.30"		
Length:	153.554		
Tangent:	76.783		
Chord:	153.548		
Middle Ordinate:	0.589		
External:	0.590		
Tangent Direction:	N 38^09'38.44" E		
Radial Direction:	S 51^50'21.56" E		
Chord Direction:	N 37^16'51.15" E		
Radial Direction:	S 53^35'56.13" E		
Tangent Direction:	N 36^24'03.87" E		

	STATION	NORTHING	EASTING
Element: Linear			
EC	10+715.362	4841281.8582	593355.5098
BC	10+837.519	4841380.1801	593428.0018
Tangent Direction:	N 36^24'03.87" E		
Tangent Length:	122.157		

	STATION	NORTHING	EASTING
Element: Circular			
BC	10+837.519	4841380.1801	593428.0018
PI	10+904.429	4841434.0354	593467.7089
CC		4838413.0102	597452.4151
EC	10+971.332	4841486.8088	593508.8429
Radius:	5000.000		

Delta:	1^32'00.20" Right
Degree of Curvature(Arc):	1^08'45.30"
Length:	133.813
Tangent:	66.911
Chord:	133.809
Middle Ordinate:	0.448
External:	0.448
Tangent Direction:	N 36^24'03.87" E
Radial Direction:	S 53^35'56.13" E
Chord Direction:	N 37^10'03.97" E
Radial Direction:	S 52^03'55.93" E
Tangent Direction:	N 37^56'04.07" E

	STATION	**NORTHING**	**EASTING**
Element: Linear			
EC	10+971.332	4841486.8088	593508.8429
BC	11+726.762	4842082.6274	593973.2508
Tangent Direction:	N 37^56'04.07" E		
Tangent Length:	755.430		

	STATION	**NORTHING**	**EASTING**
Element: Circular			
BC	11+726.762	4842082.6274	593973.2508
PI	11+918.848	4842234.1283	594091.3375
CC		4845156.4260	590029.6786
EC	12+110.745	4842394.2423	594197.4528
Radius:	5000.000		
Delta:	4^24'00.43" Left		
Degree of Curvature(Arc):	1^08'45.30"		
Length:	383.983		
Tangent:	192.086		
Chord:	383.889		
Middle Ordinate:	3.686		
External:	3.688		
Tangent Direction:	N 37^56'04.07" E		
Radial Direction:	S 52^03'55.93" E		
Chord Direction:	N 35^44'03.86" E		
Radial Direction:	S 56^27'56.36" E		
Tangent Direction:	N 33^32'03.64" E		

	STATION	**NORTHING**	**EASTING**
Element: Linear			
EC	12+110.745	4842394.2423	594197.4528
BC	12+161.907	4842436.8886	594225.7165
Tangent Direction:	N 33^32'03.64" E		
Tangent Length:	51.162		

	STATION	NORTHING	EASTING
Element: Circular			
BC	12+161.907	4842436.8886	594225.7165
PI	12+304.357	4842555.6288	594304.4113
CC		4840227.1416	597559.9358
EC	12+446.687	4842668.4703	594391.3534
Radius:	4000.000		
Delta:	4^04'45.05" Right		
Degree of Curvature(Arc):	1^25'56.62"		
Length:	284.781		
Tangent:	142.450		
Chord:	284.720		
Middle Ordinate:	2.534		
External:	2.536		
Tangent Direction:	N 33^32'03.64" E		
Radial Direction:	S 56^27'56.36" E		
Chord Direction:	N 35^34'26.17" E		
Radial Direction:	S 52^23'11.31" E		
Tangent Direction:	N 37^36'48.69" E		

	STATION	NORTHING	EASTING
Element: Linear			
EC	12+446.687	4842668.4703	594391.3534
BC	13+368.313	4843398.5318	594953.8510
Tangent Direction:	N 37^36'48.69" E		
Tangent Length:	921.625		

	STATION	NORTHING	EASTING
Element: Circular			
BC	13+368.313	4843398.5318	594953.8510
PI	13+413.176	4843434.0698	594981.2324
CC		4844314.0301	593765.6326
EC	13+458.012	4843471.1807	595006.4408
Radius:	1500.000		
Delta:	3^25'34.53" Left		
Degree of Curvature(Arc):	3^49'10.99”		
Length:	89.699		
Tangent:	44.863		
Chord:	89.686		
Middle Ordinate:	0.670		
External:	0.671		
Tangent Direction:	N 37^36'48.69" E		
Radial Direction:	S 52^23'11.31" E		
Chord Direction:	N 35^54'01.43" E		
Radial Direction:	S 55^48'45.84" E		
Tangent Direction:	N 34^11'14.16" E		

	STATION	NORTHING	EASTING

Element: Linear			
EC	13+458.012	4843471.1807	595006.4408
BC	13+646.550	4843627.1404	595112.3803
Tangent Direction:	N 34^11'14.16" E		
Tangent Length:	188.538		

	STATION	NORTHING	EASTING
Element: Circular			
BC	13+646.550	4843627.1404	595112.3803
PI	13+685.157	4843659.0761	595134.0734
CC		4842784.2910	596353.1885
EC	13+723.746	4843689.8536	595157.3806
Radius:	1500.000		
Delta:	2^56'55.28" Right		
Degree of Curvature(Arc):	3^49'10.99"		
Length:	77.196		
Tangent:	38.607		
Chord:	77.188		
Middle Ordinate:	0.497		
External:	0.497		
Tangent Direction:	N 34^11'14.16" E		
Radial Direction:	S 55^48'45.84" E		
Chord Direction:	N 35^39'41.80" E		
Radial Direction:	S 52^51'50.56" E		
Tangent Direction:	N 37^08'09.44" E		

	STATION	NORTHING	EASTING
Element: Linear			
EC	13+723.746	4843689.8536	595157.3806
BC	14+116.594	4844003.0334	595394.5457
Tangent Direction:	N 37^08'09.44" E		
Tangent Length:	392.847		

	STATION	NORTHING	EASTING
Element: Circular			
BC	14+116.594	4844003.0334	595394.5457
PI	14+201.233	4844070.5088	595445.6436
CC		4840984.4915	599380.5719
EC	14+285.857	4844136.2161	595498.9959
Radius:	5000.000		
Delta:	1^56'22.63" Right		
Degree of Curvature(Arc):	1^08'45.30"		
Length:	169.264		
Tangent:	84.640		
Chord:	169.256		
Middle Ordinate:	0.716		
External:	0.716		

Tangent Direction:	N 37^08'09.44" E
Radial Direction:	S 52^51'50.56" E
Chord Direction:	N 38^06'20.75" E
Radial Direction:	S 50^55'27.93" E
Tangent Direction:	N 39^04'32.07" E

	STATION	**NORTHING**	**EASTING**
Element: Linear			
EC	14+285.857	4844136.2161	595498.9959
BC	14+404.907	4844228.6366	595574.0386
Tangent Direction:	N 39^04'32.07" E		
Tangent Length:	119.050		

	STATION	**NORTHING**	**EASTING**
Element: Circular			
BC	14+404.907	4844228.6366	595574.0386
PI	14+419.150	4844239.6936	595583.0166
CC		4844985.0505	594642.4604
EC	14+433.392	4844250.9606	595591.7296
Radius:	1200.000		
Delta:	1^21'36.14" Left		
Degree of Curvature(Arc):	4^46'28.73"		
Length:	28.485		
Tangent:	14.243		
Chord:	28.484		
Middle Ordinate:	0.085		
External:	0.085		
Tangent Direction:	N 39^04'32.07" E		
Radial Direction:	S 50^55'27.93" E		
Chord Direction:	N 38^23'44.00" E		
Radial Direction:	S 52^17'04.07" E		
Tangent Direction:	N 37^42'55.93" E		

	STATION	**NORTHING**	**EASTING**
Element: Linear			
EC	14+433.392	4844250.9606	595591.7296
BC	14+918.959	4844635.0719	595888.7710
Tangent Direction:	N 37^42'55.93" E		
Tangent Length:	485.567		

	STATION	**NORTHING**	**EASTING**
Element: Circular			
BC	14+918.959	4844635.0719	595888.7710
PI	15+042.002	4844732.4061	595964.0415
CC		4843900.9821	596838.0402
EC	15+164.188	4844812.4396	596057.4986

Radius:	1200.000
Delta:	11^42'31.76" Right
Degree of Curvature(Arc):	4^46'28.73"
Length:	245.229
Tangent:	123.043
Chord:	244.803
Middle Ordinate:	6.259
External:	6.292
Tangent Direction:	N 37^42'55.93" E
Radial Direction:	S 52^17'04.07" E
Chord Direction:	N 43^34'11.81" E
Radial Direction:	S 40^34'32.30" E
Tangent Direction:	N 49^25'27.70" E

	STATION	**NORTHING**	**EASTING**
Element: Linear			
EC	15+164.188	4844812.4396	596057.4986
BC	15+256.592	4844872.5439	596127.6839
Tangent Direction:	N 49^25'27.70" E		
Tangent Length:	92.404		

	STATION	**NORTHING**	**EASTING**
Element: Circular			
BC	15+256.592 4844872.5439 596127.6839		
PI	15+377.304 4844951.0611 596219.3703		
CC		4845784.0014 595347.1423	
EC	15+497.206 4845046.2665 596293.5815		
Radius:	1200.000		
Delta:	11^29'18.55" Left		
Degree of Curvature(Arc):	4^46'28.73"		
Length:	240.614		
Tangent:	120.712		
Chord:	240.211		
Middle Ordinate:	6.026		
External:	6.056		
Tangent Direction:	N 49^25'27.70" E		
Radial Direction:	S 40^34'32.30" E		
Chord Direction:	N 43^40'48.42" E		
Radial Direction:	S 52^03'50.86" E		
Tangent Direction:	N 37^56'09.14" E		

	STATION	**NORTHING**	**EASTING**

Element: Linear			
EC	15+497.206	4845046.2665	596293.5815
BC	15+681.839	4845191.8863	596407.0900
Tangent Direction:	N 37^56'09.14" E		
Tangent Length:	184.633		

Appendix B

Vertical Alignment Information

Project Name: Mayfield
Description: Horizontal Alignment
Name: Mayfield
Description:
Style: Default
Vertical Alignment Name: Mayfield K-Value
Description:
Style: Default

	STATION	ELEVATION
Element: Linear		
POB	10+000.000	256.489
BVC	10+425.076	256.346
Tangent Grade:	-0.03	
Tangent Length:	425.076	

	STATION	ELEVATION
Element: Parabola		
BVC	10+425.076	256.346
VPI	10+430.115	256.345
EVC	10+435.153	256.357
VLOW	10+426.251	256.346
Length	10.077	
Entrance Grade	-0.03	
Exit Grade	0.25	
r = (g2 - g1) / L	2.86	
K = l / (g2 - g1)	35.00	
Middle Ordinate	0.004	

	STATION	ELEVATION
Element: Linear		
EVC	10+435.153	256.357
BVC	11+068.976	257.970
Tangent Grade:	0.25	
Tangent Length:	633.823	

	STATION	ELEVATION
Element: Parabola		
BVC	11+068.976	257.970
VPI	11+080.158	257.998
EVC	11+091.341	257.971
VLOW	11+080.422	257.984

Length	22.365
Stopping Sight Distance	553.102
Entrance Grade	0.25
Exit Grade	-0.24
r = (g2 - g1) / L	-2.22
K = l / (g2 - g1)	45.00
Middle Ordinate	-0.014
Middle Ordinate	

	STATION	**ELEVATION**
Element: Linear		
EVC	11+091.341	257.971
BVC	13+226.595	252.790
Tangent Grade:	-0.24	
Tangent Length:	2135.254	

	STATION	**ELEVATION**
Element: Parabola		
BVC	13+226.595	252.790
VPI	13+278.856	252.663
EVC	13+331.117	250.975
Length	104.523	
Stopping Sight Distance	142.449	
Entrance Grade	-0.24	
Exit Grade	-3.23	
r = (g2 - g1) / L	-2.86	
K = l / (g2 - g1)	35.00	
Middle Ordinate	-0.390	

	STATION	**ELEVATION**
Element: Linear		
EVC	13+331.117	250.975
BVC	13+415.108	248.263
Tangent Grade:	-3.23	
Tangent Length:	83.991	

	STATION	**ELEVATION**
Element: Parabola		
BVC	13+415.108	248.263
VPI	13+567.788	243.333
EVC	13+720.468	250.059
VLOW	13+544.269	246.178

Length	305.360
Headlight Sight Distance	168.489
Entrance Grade	-3.23
Exit Grade	4.40
r = (g2 - g1) / L	2.50
K = l / (g2 - g1)	40.00
Middle Ordinate	2.914

	STATION	**ELEVATION**
Element: Linear		
EVC	13+720.468	250.059
BVC	13+782.144	252.776
Tangent Grade:	4.40	
Tangent Length:	61.676	

	STATION	**ELEVATION**
Element: Parabola		
BVC	13+782.144	252.776
VPI	13+922.906	258.976
EVC	14+063.669	258.572
VHIGH	14+046.443	258.597
Length	281.524	
Headlight Sight Distance	179.777	
Entrance Grade	4.40	
Exit Grade	-0.29	
r = (g2 - g1) / L	-1.67	
K = l / (g2 - g1)	60.00	
Middle Ordinate	-1.651	

	STATION	**ELEVATION**
Element: Linear		
EVC	14+063.669	258.572
BVC	14+404.841	257.593
Tangent Grade:	-0.29	
Tangent Length:	341.172	

	STATION	**ELEVATION**
Element: Parabola		
BVC	14+404.841	257.593
VPI	14+507.340	257.298
EVC	14+609.840	262.257
VLOW	14+416.324	257.576

Length	204.999
Headlight Sight Distance	168.489
Entrance Grade	-0.29
Exit Grade	4.84
r = (g2 - g1) / L	2.50
K = l / (g2 - g1)	40.00
Middle Ordinate	1.313

	STATION	**ELEVATION**
Element: Linear		
EVC	14+609.840	262.257
BVC	14+610.371	262.283
Tangent Grade:	4.84	
Tangent Length:	0.531	

	STATION	**ELEVATION**
Element: Parabola		
BVC	14+610.371	262.283
VPI	14+852.848	274.014
EVC	15+095.324	266.146
VHIGH	14+900.645	269.304
Length	484.953	
Headlight Sight Distance	179.777	
Entrance Grade	4.84	
Exit Grade	-3.24	
r = (g2 - g1) / L	-1.67	
K = l / (g2 - g1)	60.00	
Middle Ordinate	-4.900	

	STATION	**ELEVATION**
Element: Linear		
EVC	15+095.324	266.146
BVC	15+121.696	265.290
Tangent Grade:	-3.24	
Tangent Length:	26.372	

	STATION		**ELEVATION**
Element: Parabola			
BVC	15+121.696	265.290	
VPI	15+212.897	262.331	
EVC	15+304.098	262.397	

VLOW	15+300.151 262.395	
Length	182.402	
Headlight Sight Distance	231.396	
Entrance Grade	-3.24	
Exit Grade	0.07	
r = (g2 - g1) / L	1.82	
K = l / (g2 - g1)	55.00	
Middle Ordinate	0.756	

	STATION	**ELEVATION**
Element: Linear		
EVC	15+304.098	262.397
POE	15+640.452	262.638
Tangent Grade:	0.07	
Tangent Length:	336.354	