AECOM Canada ULC
5090 Explorer Drive, Suite 1000
Mississauga, ON L4W 4X6
Canada

T: 905.238.0007
F: 905.238.0038
www.aecom.com

To: **Greg Wuisman, P.Eng.**
Senior Project Manager, Infrastructure Renewal
Engineering Services
Public Works, City of Hamilton

Date: April 10, 2025
Project #: 60736055

From: Kevin Phillips
Kris Link

Technical Memorandum

Subject: Technical Memorandum – Red Hill Valley Parkway Design Review from Green Hill Avenue to King Street

1. Objective

Since construction completion of the Red Hill Creek Parkway (RHVP) in 2005-2006, the City of Hamilton (the City) has completed an overlay of RHVP's existing pavement through the City's maintenance program from May 21, 2019 to July 18, 2019. A Lidar survey was completed following the overlay between Greenhill Avenue to King Street by Callon Dietz in 2019 which was reviewed through this scope of work by AECOM. The Lidar information provided includes existing conditions of RHVP and pavement elevations of the 2019 overlaid pavement.

The objective of this study is to review the above noted Lidar information provided by the City in consideration of specific geometric design guidelines for the section of RHVP between Greenhill Avenue and King Street. AECOM reviewed the survey information for two scenarios:

1. Lidar survey information reviewed based on Ministry of Transportation (MTO) Geometrical Design Manual (1992) applicable in the year of RHVP construction (2005-2006). Any potential discrepancies for the cross-falls, superelevation and transition lengths are documented and presented in this memorandum.

2. Lidar survey information reviewed based on the latest version of the applicable design guidelines (Geometric Design Guidelines for Canadian Roads, Transportation Association of Canada (TAC) - June 2017 and MTO design supplement for TAC – June 2023). Any potential discrepancies for the cross-falls, superelevation and transition lengths are documented and presented in this memorandum.

2. Approach

AECOM prepared this memorandum summarizing the findings of this design review to present to the City for their review and further action(s). As part of this investigation, AECOM has received Lidar survey data completed by Callon Dietz which provided existing topographical information of RHVP within the review limits. The Lidar data

provided has been reviewed, and the longitudinal grades and cross slopes were calculated at 20m intervals of the alignment of RHVP as an input into considering existing geometrical design conditions of the RHVP.

Our design review is based on the following assumptions and limitations as documented in this memo, and in our proposal submission as accepted by the City:

- AECOM has completed the scope of works only for the City's due diligence and internal use. The findings of this investigation shall not be used for any legal purposes by the City or by third parties. AECOM does not accept legal responsibility for previous design omissions / errors by others during construction or overlay of existing pavement, and shall not be held liable. As such, AECOM's investigation is not to be used for the purpose of witness services or as expert opinion in relation to or as a witness for any potential inquiries or legal process.
- AECOM has not independently verified and assumes the Lidar data provided in a 3-D DGN file or DTM file (CAD) file are reflective of in-situ conditions to be used for review of existing information.
- AECOM's review is limited to a geometric comparison of design standards versus the reported horizontal curvature and super-elevation for the section noted in this memo.
- The following services are excluded from the scope of works:
    - Review of other geometric design elements, such as and not limited to: sight distances, clear zone, embankments, guiderail and protection, driver behaviour, among others.
    - Review of Geotechnical engineering and pavement design including soil contamination investigations.
    - Review of Landscaping, Streetscaping and Tree inventory / Protection Plan.
    - Review of any Environmental investigations and studies such as natural environment, archaeological assessment, natural and built heritage assessment.
    - Review of illumination design of RHVP.
    - Review of Drainage and Stormwater Management.
- With respect to the preparation of any potential mitigation measures for existing reported conditions to mitigate or elevate to applicable design standards, this is not within the scope of the current design review. Recommendations for addressing deficiencies in the reported conditions will be addressed through follow-on studies that will be completed by others on behalf of the City.

3. RHVP Design Geometry

The geometry for the RHVP (Pritchard Road to Brampton Street) at the time of design provided for a maximum superelevation of 0.06 m/m (i.e. 6%), maximum vertical profile grades of 4%, a minimum horizontal radius (radius of turns) of 420 m, a design speed of 100 km/h and a posted speed of 90 km/h (the current posted is 80 km/h in the review section). Pavement Design noted in the November 2003 (Preliminary Design Report (PDR) provided that modified HL1 or an SMA (Stone Mastic Asphalt) were being considered for the surface or wearing course asphalt mixes. SMA was described as "a stone-on-stone, binder rich surface mix that provides quality rutting and cracking resistance", was noise reducing and had been shown to have improved surface texture and skid resistance characteristics.

An updated 2006 PDR states that roadway design criteria conforming to those in the MTO Geometric Design Manual (1992) had been adopted for this Project, and that the "Ontario Provincial Standard Drawings (OPSD) and Specifications (OPSS) were used as a guide for the design of roadways and structures.

The detailed design of the RHVP was split between three consulting engineering firms:

- Stantec for the design of Part A - Mud Street Interchange to South of Greenhill Avenue;
- Philips Engineering for the design of Part B – South of Greenhill Avenue to Queenston Road; and
- McCormick Rankin for the design of Part C - Queenston Road to QEW Interchange.

Stantec also designed Part D, which included signage and pavement markings, stormwater management, and landscaping details for the RHVP between the Mud Street Interchange and the QEW Interchange.

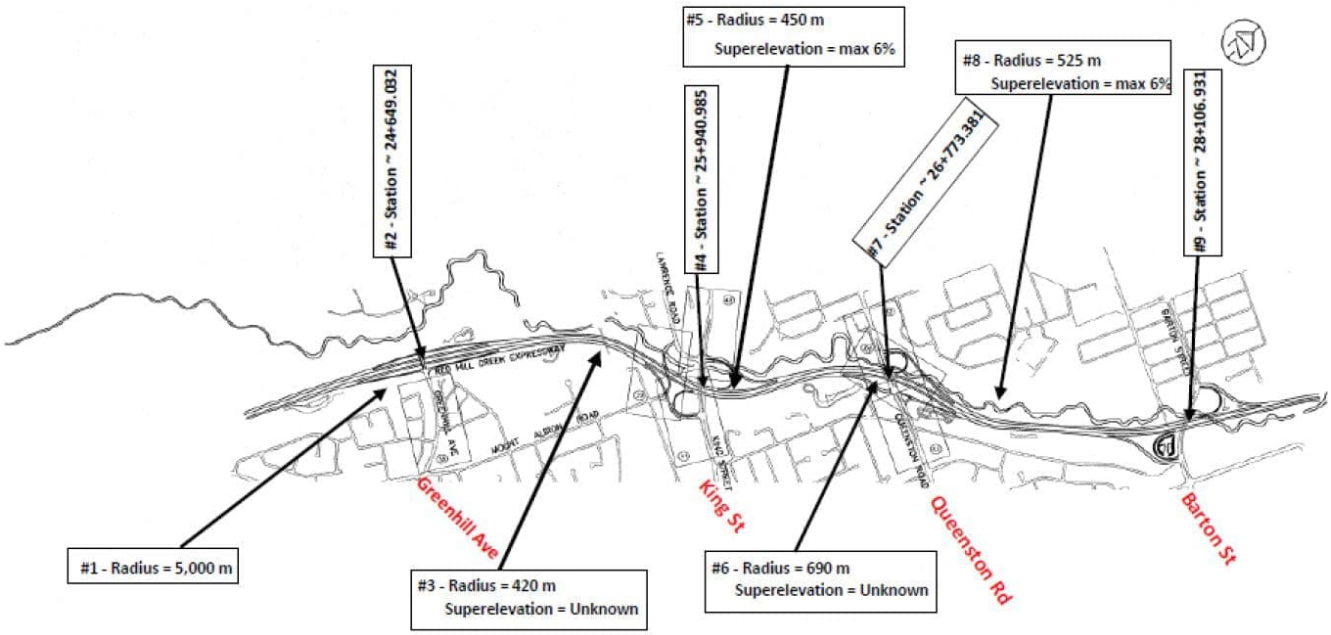
This memorandum is focused on reviewing a section of Part B of the RHVP which extends from Greenhill Avenue to King Street. **Figure 1** below shows the entire portion of Part B (South of Greenhill Ave. to Queenston Road), which has been annotated with information contained in the Philips Engineering drawings, and the McCormick Rankin drawings.

The Philips Engineering drawings contain the following design information:

- The RHVP mainline South of King Street provides a curve radius of 420 m (superelevation not described); and North of King Street provides curve radii of 450 m (superelevation of 6%), 690 m (superelevation not described) and 525 m (superelevation of 6%),
- The RHVP mainline provides longitudinal vertical grades of -0.60%, -0.61% and -2.41%.

Interchange spacing is as follows:

- Greenhill Avenue (24+649.032) to King Street (25+940.985) = 1.292 km
- King Street (25+940.985) to Queenston Road (26+773.381) = 0.832 km



Source: Overview Document #3.1: RHVP Design & Geometry Doc 4219637 v1

Figure 1 Part B RHVP – Greenhill Avenue to Queenston Road

4. Existing Roadway Geometry

4.1 Existing Roadway Geometry Analysis

As noted above, the section of this review extends from Sta. 24+649.082 at the Greenhill Avenue interchange to Sta. 25+940.985 at the King Street interchange. The existing section of RHVP between Greenhill Avenue and King Street includes three horizontal curves as per below:

1. Horizontal curve with 5,000m radius starting at Sta. 24+000 to Sta. 25+290.
2. Horizontal curve with 420m radius starting at Sta. 25+290 to Sta. 25+630.
3. Horizontal curve with 450m radius starting at Sta. 25+830 to Sta. 26+210

Radius: Based on the 1992 MTO Geometric Design Guidelines which were applicable at the time of the design of RHVP, the minimum Radius for a design speed of 100 km/h is 420m and the required super-elevation is 0.06 m/m (i.e. 6%).

However, the 2017 TAC Design Guidelines for Canadian Roads (Table 3.2.4) and MTO's Design Supplement (June 2023) have increased the minimum radius for a 100 km/h design speed to a minimum radius of 440m as shown in Figure 2. The requirement for super-elevation has remained at 0.06 m/m (i.e. 6%).

Superelevation: The maximum superelevation rate of 6% (+0.06 m/m) still required is also shown in Figures 3 and 4 below. This superelevation rate was the basis to review cross-falls of the available Lidar information along the alignment of RHVP.

It should also be noted that the curve with R=5000m radius was constructed as a Reverse Crown (+0.02 m/m). Based on design guidelines (MTO 1992 and TAC 2017) as shown on Figure 2 above, this curve alternatively could have used the Normal Crown (-0.02 m/m).

Design Speed (km/h)		Minimum Radius (m)				
		Crown Section			Superelevated Section	
		Normal[4] (-0.02 m/m)	Reverse[3,4] (+0.02 m/m)		Maximum Rate	
			e_{max} +0.04	e_{max} +0.06	+0.04 (m/m)	+0.06 (m/m)
Low Speed[1]	30	420	30	40	20	20
	40	660	65	80	45	40
	50	950	115	135	80	75
	60	1290	185	220	130	120
High Speed[2]	70	1680	290	330	200	190
	80	2130	400	450	280	250
	90	2620	530	600	380	340
	100	3180	690	770	490	440

Source: Geometric Design Guide for Canadian Roads – June 2017
Note: Red arrows and shading added to highlight design guidance

Figure 2 TAC Table 3.2.4 – Minimum Radii for Urban Designs

4.2 Design Review Findings

We have reviewed the radii and transition lengths for the curves along the subject section of the RHVP alignment, in addition to applied superelevation separately for northbound and southbound lanes per the 1992 MTO geometric design guidelines and as per Figures 3 and 4 below (TAC Tables 3.2.6 and 3.2.9 provided in 2017 TAC Design Guide for Canadian Roads).

The findings of our review for the section of RHVP which deviate from the 6% superelevation recommendations of the 1992 MTO geometric design guidelines and the existing TAC geometric design guidelines are listed below and provided in further detail in the **Appendix**.

Horizontal curve with minimum radius of 420m (Sta. 25+290 to Sta. 25+630):

1.1. NORTHBOUND LANES

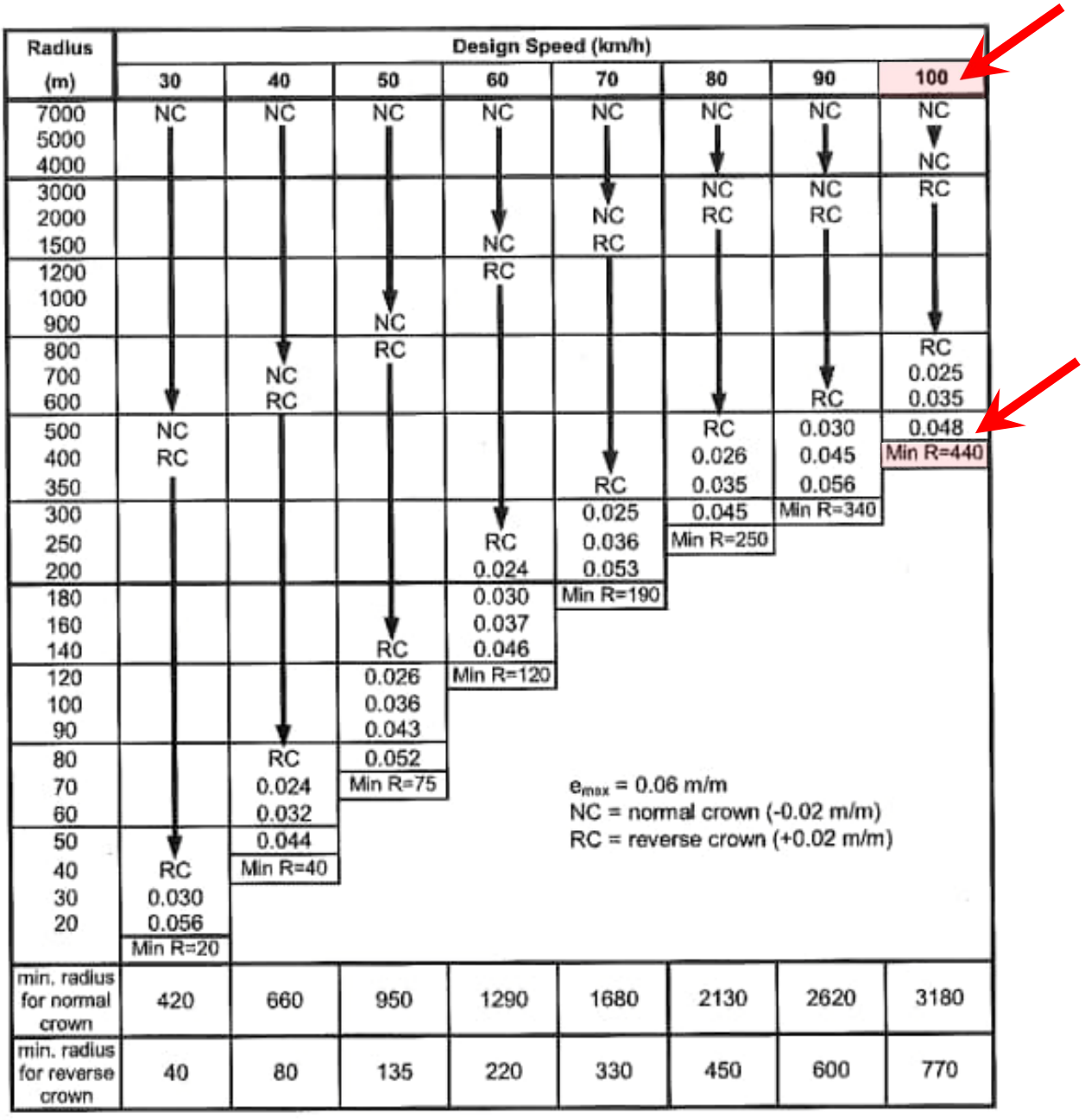
1.1.1. Lane No.1 (INNER lane) – Below design guidelines through entire curve. Maximum superelevation reaches 4.0% (@ Sta. 25+460). Approximate average difference from desired rate of superelevation is 2.9% (including transitions).

1.1.2 Lane No. 2 (OUTER lane) – Superelevation ranges from 4.1% to 7.0%. Approximate average difference from desired rate of superelevation = 0.8% (including transitions).

1.2. SOUTHBOUND LANES

1.2.1. Lane No.2 (OUTER Lane) - Below design guidelines through entire curve. Maximum superelevation reaches 4.8% (@ Sta. 25+460). Average difference from desired rate of superelevation = 2.8% (including transitions).

1.2.2. Lane No. 1 (INNER Lane) – Superelevation ranges from 4.7% to 6.6%. Approximate average difference from desired rate of superelevation = 0.9% (including transitions).



Radius (m)	Design Speed (km/h)							
	30	40	50	60	70	80	90	100
7000 5000 4000	NC	NC	NC	NC	NC	NC	NC	NC NC
3000 2000 1500				NC	NC RC	NC RC	NC RC	RC
1200 1000 900			NC	RC				
800 700 600		NC RC	RC				RC	RC 0.025 0.035
500 400 350	NC RC				RC	RC 0.026 0.035	0.030 0.045 0.056	0.048 Min R=440
300 250 200				RC 0.024	0.025 0.036 0.053	0.045 Min R=250	Min R=340	
180 160 140			RC	0.030 0.037 0.046	Min R=190			
120 100 90			0.026 0.036 0.043	Min R=120				
80 70 60		RC 0.024 0.032	0.052 Min R=75					
50 40 30 20	RC 0.030 0.056 Min R=20	0.044 Min R=40						
min. radius for normal crown	420	660	950	1290	1680	2130	2620	3180
min. radius for reverse crown	40	80	135	220	330	450	600	770

e_{max} = 0.06 m/m
NC = normal crown (-0.02 m/m)
RC = reverse crown (+0.02 m/m)

Source: Geometric Design Guide for Canadian Roads – June 2017
Note: Red arrows and shading added to highlight design guidance

Figure 3 TAC Table 3.2.9- Superelevation Rates for Urban Design e=0.06 m/m

Design Speed (km/h)	40			50			60			70			80			90			100			110			120			130		
		A			A			A			A			A			A			A			A			A			A	
Radius (m)	e	2 lane	3&4 lane	e	2 lane	3&4 lane	e	2 lane	3&4 lane	e	2 lane	3&4 lane	e	2 lane	3&4 lane	e	2 lane	3&4 lane	e	2 lane	3&4 lane	e	2 lane	3&4 lane	e	2 lane	3&4 lane	e	2 lane	3&4 lane
7000	NC			NC			NC			NC			NC			NC			NC			NC			RC			RC	710	710
5000	NC			NC			NC			NC			NC			NC			NC			RC	555	555	RC	580	580	RC	600	600
4000	NC			NC			NC			NC			NC			NC			RC	475	475	RC	495	495	RC	515	515	0.023	540	540
3000	NC			NC			NC			NC			RC			RC	390	390	RC	410	410	0.022	430	430	0.024	450	450	0.036	465	465
2000	NC			NC			NC			RC	275	275	RC	300	300	0.023	300	300	0.026	335	335	0.029	350	350	0.034	365	365	0.04	380	380
1500	NC			NC			RC	225	225	RC	250	250	0.024	250	250	0.029	270	270	0.032	290	290	0.036	305	305	0.042	315	315	0.049	330	335
1200	NC			NC			RC	200	200	0.023	225	225	0.028	225	225	0.033	240	240	0.038	260	260	0.043	270	270	0.049	285	290	0.055	295	320
1000	NC			NC	170	170	0.021	175	175	0.027	200	200	0.032	200	200	0.037	225	225	0.043	235	235	0.048	245	255	0.054	260	280	0.058	280	300
900	NC			NC	150	150	0.023	175	175	0.029	200	200	0.034	200	200	0.039	200	200	0.045	225	225	0.051	235	250	0.058	250	270	0.06	280	300
800	NC			RC	150	150	0.025	160	160	0.031	175	175	0.038	175	175	0.042	200	200	0.048	210	215	0.054	220	240	0.06	250	260	min R = 950		
700	NC			0.021	140	140	0.027	150	150	0.034	175	175	0.039	175	175	0.045	185	195	0.051	200	210	0.058	220	235	0.06	250	260			
600	NC	120	120	0.024	125	125	0.030	140	140	0.037	175	175	0.042	175	175	0.048	175	185	0.054	190	200	0.06	220	220	min R = 750					
500	RC	100	100	0.027	120	120	0.034	125	125	0.041	150	150	0.046	150	160	0.052	160	175	0.059	190	190	0.06	220	220						
400	0.023	90	90	0.031	100	100	0.038	115	120	0.045	140	150	0.051	135	150	0.057	160	165	0.060	190	190	min R = 600								
350	0.025	90	90	0.034	100	100	0.041	110	115	0.048	125	135	0.054	125	140	0.059	160	160	min R = 440											
300	0.028	80	80	0.037	90	100	0.044	100	110	0.051	120	125	0.057	125	135	0.060	160	160												
250	0.031	75	80	0.040	85	90	0.048	90	100	0.055	120	125	0.060	125	125	min R = 340														
220	0.034	70	80	0.043	80	90	0.050	90	100	0.057	110	120	0.060	125	125															
200	0.036	70	75	0.045	75	90	0.052	85	100	0.059	110	110	min R = 250																	
180	0.038	60	75	0.047	70	90	0.054	85	90	0.060	110	110																		
160	0.040	60	75	0.049	70	85	0.056	85	90	min R = 190																				
140	0.043	60	75	0.052	65	80	0.059	85	90																					
120	0.046	60	70	0.055	65	75	0.060																							
100	0.049	50	65	0.058	65	70	min R = 130																							
90	0.051	50	60	0.060	65	70																								
80	0.054	50	60	0.060	65	70																								
70	0.056	50	60	min R = 90																										
60	0.059	50	60	e_{max} = 0.06																										
	0.059	50	60																											
	min R =55																													

Notes: e = superelevation (m/m)
A = spiral parameter in metres
NC = normal cross section
RC = remove adverse crown and superelevate at normal rate
Spiral length, L = A^2 / Radius
Spiral parameters are minimum and higher values may be used
For 6 lane pavement: above the dashed line use 4 lane values, below the dashed line, use 4 lane values x 1.15.

A divided road having a median less than 3 m wide may be treated as a single pavement.

Source: Geometric Design Guide for Canadian Roads – June 2017

Figure 4 TAC Table 3.2.6 - Superelevation and Minimum Spiral Parameters e_{max} = 0.06 m/m

5. Review Summary

Following is a summary of findings:

A. A section of the RHVP alignment south of the King Street interchange (25+940.985) was constructed with minimum horizontal radius of R=420m, which met the requirements of the MTO Geometric Design Guidelines (1992) in place at the time the RHVP was designed based on a design speed of 100 km/h. More recent guidelines set out in the 2017 TAC Manual identify a minimum radius of R=440m, which is not met by one of the curves in the study area.

B. A section of RHVP (Sta. 25+290 to Sta. 25+630) south of the King Street interchange with a minimum horizontal curve has insufficient superelevation based on the older design guidelines and the current 2017 TAC Manual.

6. Conclusions

Based on the findings of this review, there are design concerns with the alignment of the RHVP south of King Street (generally from Stations 25+290 to 25+630) which includes:

1. The existing minimum horizontal curve of 420m met the requirements of the MTO Geometric Design Guidelines (1992) in place at the time the RHVP was designed, but is not consistent with the minimum requirement of 440m based on current design guidelines (TAC 2017). This should be addressed as part of a future rehabilitation assignment as part of the City's Capital program.

2. Within this section of the RHVP, there are sections where the superelevation does not meet the required 6% (0.06 m/m) standards for the above radii of either the Geometric Design Standards (1992) or the TAC Design Manual (2017). This is of particular concern through the minimum horizontal curve section from Stations 25+290 to 25+630. It is recommended to reconstruct to the superelevation requirements in the TAC guidelines.

Statement of Qualifications and Limitations

The attached memorandum Report (the "Report") has been prepared by AECOM Canada ULC ("AECOM") for the benefit of the Client ("Client") in accordance with the agreement between AECOM and Client, including the scope of work detailed therein (the "Agreement").

The information, data, recommendations and conclusions contained in the Report (collectively, the "Information"):

- is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report (the "Limitations");
- represents AECOM's professional judgement in light of the Limitations and industry standards for the preparation of similar reports;
- may be based on information provided to AECOM which has not been independently verified;
- has not been updated since the date of issuance of the Report and its accuracy is limited to the time period and circumstances in which it was collected, processed, made or issued;
- must be read as a whole and sections thereof should not be read out of such context;
- was prepared for the specific purposes described in the Report and the Agreement; and
- in the case of subsurface, environmental or geotechnical conditions, may be based on limited testing and on the assumption that such conditions are uniform and not variable either geographically or over time.

AECOM shall be entitled to rely upon the accuracy and completeness of information that was provided to it and has no obligation to update such information. AECOM accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared and, in the case of subsurface, environmental or geotechnical conditions, is not responsible for any variability in such conditions, geographically or over time.

AECOM agrees that the Report represents its professional judgement as described above and that the Information has been prepared for the specific purpose and use described in the Report and the Agreement, but AECOM makes no other representations, or any guarantees or warranties whatsoever, whether express or implied, with respect to the Report, the Information or any part thereof.

Without in any way limiting the generality of the foregoing, any estimates or opinions regarding probable construction costs or construction schedule provided by AECOM represent AECOM's professional judgement in light of its experience and the knowledge and information available to it at the time of preparation. Since AECOM has no control over market or economic conditions, prices for construction labour, equipment or materials or bidding procedures, AECOM, its directors, officers and employees are not able to, nor do they, make any representations, warranties or guarantees whatsoever, whether express or implied, with respect to such estimates or opinions, or their variance from actual construction costs or schedules, and accept no responsibility for any loss or damage arising therefrom or in any way related thereto. Persons relying on such estimates or opinions do so at their own risk.

Except (1) as agreed to in writing by AECOM and Client; (2) as required by-law; or (3) to the extent used by governmental reviewing agencies for the purpose of obtaining permits or approvals, the Report and the Information may be used and relied upon only by Client.

AECOM accepts no responsibility, and denies any liability whatsoever, to parties other than Client who may obtain access to the Report or the Information for any injury, loss or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report or any of the Information ("improper use of the Report"), except to the extent those parties have obtained the prior written consent of AECOM to use and rely upon the Report and the Information. Any injury, loss or damages arising from improper use of the Report shall be borne by the party making such use.

This Statement of Qualifications and Limitations is attached to and forms part of the Report and any use of the Report is subject to the terms hereof.

Appendix A: Northbound RHVP Existing Pavement Cross Fall Analysis

TABLE LEGEND

xx+xxx	Curve section not in review area
xx+xxx	Tangent section not in review area
xx+xxx	Review focus area
xx+xxx	Curve transition for curve below design guidelines
xx+xxx	Curve below design guidelines
x.x%	Denotes where superelevation is <6% in curve and curve transition
x.x%	Denotes where superelevation is >6% in curve and curve transition
x.x%	Denotes where reported superelevation deviates from guidelines >2%

EXISTING PAVEMENT CROSS-FALL
NORTHBOUND LANES

STATION	CURVE R, e, Ls	EXISTING PAVEMENT SURVEY DATA: INNER EDGE OF PAVEMENT OFFSET from Median Centerline	INNER EDGE OF PAVEMENT ELEVATION	INNER EDGE OF PAVEMENT CROSS-FALL	CENTERLINE-NBL OFFSET from Median Centerline	CENTERLINE-NBL ELEVATION	OUTER EDGE OF PAVEMENT OFFSET from Median Centerline	OUTER EDGE OF PAVEMENT ELEVATION	OUTER EDGE OF PAVEMENT CROSS-FALL	EDGE OF AUXILLARY LANE OFFSET from Median Centerline	EDGE OF AUXILLARY LANE ELEVATION	EDGE OF AUXILLARY LANE CROSS-FALL	STATION	CURRENT STANDARD DESIGN SUPERELEVATION INNER E.P.	CURRENT STANDARD DESIGN SUPERELEVATION OUTER E.P.	COMPARISON DIFFERENCE INNER E.P.	COMPARISON DIFFERENCE OUTER E.P.
24+000	R-5000m RIGHT e=NC	7.844	124.706	1.4%	11.704	124.652	15.551	124.532	-3.1%				24+000	0.69%	-2.00%	0.7%	-1.1%
24+020		7.825	124.211	1.4%	11.676	124.156	15.532	124.043	-2.9%				24+020	1.87%	-2.00%	-0.4%	-0.9%
24+040		7.800	123.724	1.5%	11.597	123.668	16.148	123.555	-2.5%				24+040	2.00%	-2.00%	-0.5%	-0.5%
24+060		7.770	123.251	1.7%	11.568	123.188	17.228	123.054	-2.4%				24+060	2.00%	-2.00%	-0.3%	-0.4%
24+080		7.715	122.760	1.3%	11.500	122.710	18.172	122.526	-2.8%				24+080	2.00%	-2.00%	-0.7%	-0.8%
24+100		7.659	122.292	1.4%	11.411	122.238	18.705	122.036	-2.8%				24+100	2.00%	-2.00%	-0.6%	-0.8%
24+120		7.570	121.822	1.8%	11.375	121.752	18.835	121.563	-2.5%				24+120	2.00%	-2.00%	-0.2%	-0.5%
24+140		7.515	121.336	1.7%	11.345	121.270	18.811	121.079	-2.6%				24+140	2.00%	-2.00%	-0.3%	-0.6%
24+160		7.480	120.861	1.7%	11.273	120.796	18.840	120.582	-2.8%				24+160	2.00%	-2.00%	-0.3%	-0.8%
24+180		7.445	120.367	1.5%	11.222	120.312	18.909	120.121	-2.5%				24+180	2.00%	-2.00%	-0.5%	-0.5%
24+200		7.443	119.877	1.0%	11.196	119.838	19.077	119.679	-2.0%				24+200	2.00%	-2.00%	-1.0%	0.0%
24+220		7.459	119.404	1.0%	11.205	119.366	19.332	119.199	-2.1%				24+220	2.00%	-2.00%	-1.0%	-0.1%
24+240		7.486	118.933	1.1%	11.262	118.892	19.723	118.712	-2.1%				24+240	2.00%	-2.00%	-0.9%	-0.1%
24+260		7.508	118.450	0.7%	11.278	118.422	15.136	118.339	-2.2%				24+260	2.00%	-2.00%	-1.3%	-0.2%
24+280		7.511	117.948	0.2%	11.330	117.940	15.219	117.875	-1.7%				24+280	2.00%	-2.00%	-1.8%	0.3%
24+300		7.549	117.466	0.1%	11.394	117.462	15.269	117.390	-1.9%				24+300	2.00%	-2.00%	-1.9%	0.1%
24+320		7.596	117.002	0.5%	11.411	116.984	15.325	116.888	-2.5%				24+320	2.00%	-2.00%	-1.5%	-0.5%
24+340		7.608	116.527	0.6%	11.411	116.503	15.307	116.405	-2.5%				24+340	2.00%	-2.00%	-1.4%	-0.5%
24+360		7.613	116.057	0.7%	11.411	116.029	15.258	115.933	-2.5%				24+360	2.00%	-2.00%	-1.3%	-0.5%
24+380		7.651	115.578	0.8%	11.424	115.549	15.238	115.448	-2.6%				24+380	2.00%	-2.00%	-1.2%	-0.6%
24+400		7.688	115.088	0.7%	11.463	115.060	15.237	114.959	-2.7%				24+400	2.00%	-2.00%	-1.3%	-0.7%
24+420		7.686	114.603	0.8%	11.488	114.572	15.233	114.478	-2.5%				24+420	2.00%	-2.00%	-1.2%	-0.5%
24+440		7.687	114.123	0.7%	11.479	114.095	15.194	114.003	-2.5%				24+440	2.00%	-2.00%	-1.3%	-0.5%
24+460		7.699	113.650	0.9%	11.473	113.617	15.170	113.521	-2.6%				24+460	2.00%	-2.00%	-1.1%	-0.6%
24+480		7.705	113.176	1.2%	11.497	113.129	15.311	113.035	-2.5%				24+480	2.00%	-2.00%	-0.8%	-0.5%
24+500		7.699	112.693	1.2%	11.515	112.648	15.382	112.556	-2.4%				24+500	2.00%	-2.00%	-0.8%	-0.4%
24+520		7.711	112.219	1.3%	11.513	112.168	15.288	112.072	-2.5%				24+520	2.00%	-2.00%	-0.7%	-0.5%
24+540		7.721	111.755	1.8%	11.507	111.686	15.291	111.590	-2.5%				24+540	2.00%	-2.00%	-0.2%	-0.5%
24+560		7.704	111.283	2.2%	11.461	111.201	15.261	111.108	-2.4%				24+560	2.00%	-2.00%	0.2%	-0.4%
24+580		7.694	110.809	2.5%	11.516	110.714	15.203	110.621	-2.5%				24+580	2.00%	-2.00%	0.5%	-0.5%
24+600		7.703	110.312	1.6%	11.492	110.251	15.303	110.155	-2.5%				24+600	2.00%	-2.00%	-0.4%	-0.5%
24+620		7.663	109.813	1.2%	11.458	109.766	15.251	109.665	-2.7%				24+620	2.00%	-2.00%	-0.8%	-0.7%
24+640		7.623	109.321	1.0%	11.426	109.282	15.222	109.180	-2.7%				24+640	2.00%	-2.00%	-1.0%	-0.7%
24+660		7.618	108.868	1.5%	11.433	108.811	15.212	108.711	-2.6%				24+660	2.00%	-2.00%	-0.5%	-0.6%
24+680		7.655	108.367	0.9%	11.475	108.332	15.198	108.248	-2.3%				24+680	2.00%	-2.00%	-1.1%	-0.3%
24+700		7.646	107.882	1.0%	11.466	107.845	15.240	107.768	-2.0%				24+700	2.00%	-2.00%	-1.0%	0.0%
24+720		7.620	107.410	0.8%	11.414	107.378	15.271	107.293	-2.2%				24+720	2.00%	-2.00%	-1.2%	-0.2%
24+740		7.580	106.925	0.8%	11.355	106.893	15.168	106.812	-2.1%				24+740	2.00%	-2.00%	-1.2%	-0.1%
24+760		7.493	106.430	0.8%	11.280	106.399	15.043	106.321	-2.1%				24+760	2.00%	-2.00%	-1.2%	-0.1%
24+780		7.444	105.946	0.5%	11.234	105.927	15.040	105.850	-2.0%				24+780	2.00%	-2.00%	-1.5%	0.0%
24+800		7.460	105.469	0.6%	11.268	105.446	15.045	105.370	-2.0%				24+800	2.00%	-2.00%	-1.4%	0.0%
24+820		7.535	104.991	0.9%	11.305	104.958	15.113	104.889	-1.8%				24+820	2.00%	-2.00%	-1.1%	0.2%
24+840		7.603	104.521	1.2%	11.343	104.475	15.125	104.411	-1.7%				24+840	2.00%	-2.00%	-0.8%	0.3%
24+860		7.620	104.041	0.9%	11.399	104.008	15.160	103.931	-2.0%				24+860	2.00%	-2.00%	-1.1%	0.0%
24+880		7.614	103.565	0.8%	11.438	103.536	15.249	103.453	-2.2%				24+880	2.00%	-2.00%	-1.2%	-0.2%
24+900		7.633	103.097	0.7%	11.444	103.070	15.305	102.985	-2.2%				24+900	2.00%	-2.00%	-1.3%	-0.2%
24+920		7.687	102.618	0.7%	11.479	102.590	15.308	102.506	-2.2%				24+920	2.00%	-2.00%	-1.3%	-0.2%
24+940		7.690	102.121	0.9%	11.517	102.086	15.324	102.009	-2.0%				24+940	2.00%	-2.00%	-1.1%	0.0%
24+960		7.684	101.621	0.8%	11.476	101.589	15.307	101.504	-2.2%				24+960	2.00%	-2.00%	-1.2%	-0.2%
24+980		7.656	101.110	0.2%	11.427	101.102	15.294	101.019	-2.1%				24+980	2.00%	-2.00%	-1.8%	-0.1%
25+000		7.646	100.615	0.4%	11.384	100.601	15.323	100.535	-1.7%				25+000	2.00%	-2.00%	-1.6%	0.3%
25+020		7.613	100.137	1.2%	11.389	100.092	15.330	100.006	-2.2%				25+020	2.00%	-2.00%	-0.8%	-0.2%
25+040		7.625	99.705	0.9%	11.453	99.671	15.293	99.575	-2.5%				25+040	2.00%	-2.00%	-1.1%	-0.5%
25+060		7.626	99.271	0.6%	11.399	99.248	15.218	99.154	-2.5%				25+060	2.00%	-2.00%	-1.4%	-0.5%
25+080		7.634	98.810	0.6%	11.411	98.789	15.096	98.718	-1.9%	19.878	98.647	-1.5%	25+080	2.00%	-2.00%	-1.4%	0.1%
25+100		7.628	98.435	0.5%	11.381	98.418	15.127	98.333	-2.3%	19.509	98.239	-2.1%	25+100	2.00%	-2.00%	-1.5%	-0.3%
25+120		7.605	98.064	0.6%	11.429	98.041	15.191	97.944	-2.6%	19.243	97.847	-2.4%	25+120	2.00%	-2.00%	-1.4%	-0.6%
25+140		7.692	97.710	1.2%	11.434	97.666	15.246	97.565	-2.6%	18.997	97.468	-2.6%	25+140	2.00%	-2.00%	-0.8%	-0.6%
25+160		7.720	97.355	1.3%	11.504	97.306	15.269	97.197	-2.9%	18.868	97.114	-2.3%	25+160	2.00%	-2.00%	-0.7%	-0.9%
25+180		7.709	97.003	1.6%	11.479	96.941	15.273	96.846	-2.5%	18.859	96.773	-2.0%	25+180	2.00%	-2.00%	-0.4%	-0.5%
25+200		7.702	96.659	1.6%	11.481	96.598	15.266	96.494	-2.7%	18.893	96.404	-2.5%	25+200	2.00%	-2.00%	-0.4%	-0.7%
25+220		7.753	96.337	1.5%	11.526	96.282	15.263	96.173	-2.9%	18.900	96.086	-2.4%	25+220	2.00%	-2.00%	-0.5%	-0.9%
25+240		7.843	96.049	1.9%	11.591	95.978	15.321	95.856	-3.3%	18.979	95.750	-2.9%	25+240	2.40%	-2.40%	-0.5%	-0.9%
25+260		8.052	95.775	2.5%	11.833	95.680	15.538	95.539	-3.8%	19.128	95.432	-3.0%	25+260	3.33%	-3.33%	-0.8%	-0.5%
25+280		8.501	95.499	2.7%	12.215	95.400	15.986	95.233	-4.4%	19.576	95.114	-3.3%	25+280	4.26%	-4.26%	-1.6%	-0.2%
25+300	R-420m RIGHT e=6.0%; Ls=85.95	8.995	95.228	2.7%	12.701	95.129	16.458	94.943	-5.0%	20.078	94.813	-3.6%	25+300	5.19%	-5.19%	-2.5%	0.2%
25+320		9.126	94.981	2.9%	12.905	94.873	16.563	94.681	-5.2%	20.370	94.553	-3.4%	25+320	6.00%	-6.00%	-3.1%	0.8%
25+340		9.035	94.757	3.2%	12.825	94.637	16.551	94.427	-5.6%	20.427	94.293	-3.5%	25+340	6.00%	-6.00%	-2.8%	0.4%
25+360		8.813	94.531	3.1%	12.523	94.416	16.316	94.203	-5.6%	20.229	94.060	-3.7%	25+360	6.00%	-6.00%	-2.9%	0.4%
25+380		8.536	94.331	3.2%	12.238	94.211	16.012	93.979	-6.1%	19.863	93.820	-4.1%	25+380	6.00%	-6.00%	-2.8%	-0.1%
25+400		8.235	94.143	3.4%	11.975	94.015	15.736	93.780	-6.2%	19.510	93.624	-4.1%	25+400	6.00%	-6.00%	-2.6%	-0.2%
25+420		7.898	93.959	3.5%	11.639	93.829	15.419	93.590	-6.3%	19.119	93.437	-4.1%	25+420	6.00%	-6.00%	-2.5%	-0.3%
25+440		7.568	93.830	3.9%	11.336	93.684	15.170	93.411	-7.1%	18.771	93.215	-5.4%	25+440	6.00%	-6.00%	-2.1%	-1.1%
25+460		7.354	93.712	4.0%	11.117	93.560	15.258	93.294	-6.4%	18.835	93.086	-5.8%	25+460	6.00%	-6.00%	-2.0%	-0.4%
25+480		7.354	93.589	3.5%	11.118	93.458	15.844	93.167	-6.2%	19.406	93.003	-4.6%	25+480	6.00%	-6.00%	-2.5%	-0.2%
25+500		7.531	93.480	2.7%	11.364	93.378	16.455	93.124	-5.0%	20.104	92.934	-5.2%	25+500	6.00%	-6.00%	-3.3%	1.0%
25+520		7.965	93.400	2.9%	11.838	93.289	17.420	93.040	-4.5%	21.053	92.877	-4.5%	25+520	6.00%	-6.00%	-3.1%	1.5%
25+540		8.601	93.298	2.7%	12.502	93.194	18.412	92.949	-4.1%	22.042	92.800	-4.1%	25+540	6.00%	-6.00%	-3.3%	1.9%
25+560		9.001	93.199	2.3%	12.886	93.110	19.492	92.879	-3.5%	23.147	92.754	-3.4%	25+560	6.00%	-6.00%	-3.7%	2.5%
25+580		9.065	93.107	1.8%	12.948	93.036	20.521	92.819	-2.9%	24.294	92.701	-3.1%	25+580	6.00%	-6.00%	-4.2%	3.1%
25+600		9.074	93.012	1.6%	12.918	92.952	16.776	92.827	-3.2%				25+600	5.48%	-5.48%	-3.9%	2.2%
25+620		8.708	92.934	1.5%	12.570	92.876	16.434	92.767	-2.8%				25+620	4.09%	-4.09%	-2.6%	1.3%
25+640	TANGENT	8.095	92.831	0.9%	12.032	92.797	15.855	92.704	-2.4%				25+640	2.70%	-2.70%	-1.8%	0.3%
25+660		7.838	92.732	0.5%	11.590	92.714	15.423	92.633	-2.1%				25+660	1.30%	-2.00%	-0.8%	-0.1%
25+680		7.758	92.626	0.7%	11.588	92.600	15.306	92.505	-2.6%				25+680	-0.09%	-2.00%	0.8%	-0.6%
25+700		7.685	92.534	0.8%	11.530	92.502	15.240	92.397	-2.8%				25+700	-1.43%	-2.00%	2.3%	-0.8%
25+720		7.640	92.452	0.4%	11.448	92.438	15.219	92.347	-2.4%				25+720	-2.00%	-2.00%	2.4%	-0.4%
25+740		7.556	92.337	-0.2%	11.450	92.346	15.194	92.293	-1.4%				25+740	-2.00%	-2.00%	1.8%	0.6%
25+760		7.590	92.236	-0.3%	11.475	92.249	15.301	92.195	-1.4%				25+760	-2.00%	-1.63%	1.7%	0.2%
25+780		7.574	92.110	-0.9%	11.427	92.145	15.222	92.118	-0.7%				25+780	-2.00%	-0.30%	1.1%	-0.4%
25+800		7.549	92.000	-1.5%	11.375	92.059	15.138	92.074	0.4%				25+800	-2.00%	1.15%	0.5%	-0.7%
25+820		7.304	91.895	-2.5%	11.088	91.989	14.833	92.053	1.7%				25+820	-2.63%	2.63%	0.1%	-0.9%
25+840	R-450m LEFT e=5.9%; Ls=80.22	6.843	91.800	-4.0%	10.566	91.949	14.357	92.050	2.7%				25+840	-4.11%	4.11%	0.1%	-1.4%
25+860		6.647	91.766	-4.4%	10.402	91.931	14.293	92.061	3.3%				25+860	-5.58%	5.58%	1.2%	-2.2%
25+880		6.705	91.688	-5.4%	10.412	91.889	14.234	92.044	4.1%				25+880	-5.93%	5.93%	0.5%	-1.9%
25+900		6.679	91.587	-5.9%	10.571	91.817	14.250	92.008	5.2%				25+900	-5.93%	5.93%	0.0%	-0.7%
25+920		6.645	91.481	-5.8%	10.546	91.707	14.283	91.906	5.3%				25+920	-5.93%	5.93%	0.1%	-0.6%
25+940		6.561	91.368	-5.5%	10.440	91.582	14.266	91.780	5.2%				25+940	-5.93%	5.93%	0.4%	-0.8%
25+960		6.599	91.219	-5.8%	10.403	91.441	14.289	91.650	5.4%				25+960	-5.93%	5.93%	0.1%	-0.6%
25+980		6.655	91.076	-6.1%	10.404	91.303	14.245	91.508	5.3%	17.878	91.686	4.9%	25+980	-5.93%	5.93%	-0.1%	-0.6%
26+000		6.742	90.976	-5.6%	10.503	91.188	14.268	91.393	5.4%	17.714	91.559	4.8%	26+000	-5.93%	5.93%	0.3%	-0.5%
26+020		6.766	90.851	-5.6%	10.570	91.063	14.317	91.277	5.7%	17.856	91.438	4.5%	26+020	-5.93%	5.93%	0.4%	-0.2%
26+040		6.945	90.697	-6.3%	10.727	90.934	14.363	91.146	5.8%	18.117	91.316	4.5%	26+040	-5.93%	5.93%	-0.3%	-0.1%
26+060		7.114	90.591	-6.3%	10.904	90.829	14.514	91.028	5.5%	18.212	91.176	4.0%	26+060	-5.93%	5.93%	-0.3%	-0.4%
26+080		7.120	90.482	-6.1%	10.868	90.712	14.467	90.910	5.5%	18.147	91.064	4.2%	26+080	-5.93%	5.93%	-0.2%	-0.4%
26+100		6.911	90.341	-5.9%	10.658	90.562	14.333	90.772	5.7%	17.969	90.938	4.6%	26+100	-5.93%	5.93%	0.0%	-0.2%
26+120		6.758	90.216	-5.5%	10.652	90.432	14.416	90.635	5.4%	17.869	90.802	4.8%	26+120	-5.93%	5.93%	0.4%	-0.5%
26+140		6.796	90.078	-6.1%	10.702	90.315	14.599	90.517	5.2%	18.074	90.676	4.6%	26+140	-5.93%	5.93%	-0.1%	-0.7%
26+160		6.882	89.931	-6.3%	10.688	90.171	14.663	90.396	5.7%	18.146	90.555	4.6%	26+160	-5.93%	5.93%	-0.4%	-0.3%
26+180		6.983	89.773	-5.9%	10.819	89.999	14.752	90.209	5.3%	18.292	90.379	4.8%	26+180	-5.93%	5.93%	0.0%	-0.6%
26+200		7.240	89.636	-4.7%	11.072	89.818	14.890	89.980	4.2%	18.512	90.117	3.8%	26+200	-4.57%	4.57%	-0.2%	-0.3%
26+220	TANGENT	7.624	89.470	-4.1%	11.401	89.624	15.242	89.735	2.9%	18.943	89.839	2.8%	26+220	-3.09%	3.09%	-1.0%	-0.2%
26+240		7.714	89.308	-3.4%	11.643	89.443	15.386	89.532	2.4%	19.101	89.585	1.4%	26+240	-2.00%	1.61%	-1.4%	0.8%
26+260		7.689	89.154	-2.5%	11.584	89.251	15.346	89.318	1.8%	19.104	89.355	1.0%	26+260	-2.00%	0.13%	-0.5%	1.6%
26+280		7.666	89.008	-1.6%	11.496	89.068	15.259	89.094	0.7%	19.013	89.106	0.3%	26+280	-2.00%	-1.21%	0.4%	1.9%
26+300		7.626	88.881	-0.5%	11.459	88.901	15.188	88.891	-0.3%	18.913	88.871	-0.5%	26+300	-2.00%	-2.00%	1.5%	1.7%
26+320		7.568	88.741	0.4%	11.436	88.727	15.121	88.681	-1.2%	18.803	88.626	-1.5%	26+320	-1.44%	-2.00%	1.8%	0.8%
26+340		7.494	88.594	0.8%	11.338	88.564	15.100	88.485	-2.1%	18.679	88.393	-2.6%	26+340	-0.11%	-2.00%	0.9%	-0.1%
26+360		7.499	88.464	1.7%	11.268	88.400	15.149	88.279	-3.1%	18.660	88.180	-2.8%	26+360	1.47%	-2.00%	0.2%	-1.1%

Appendix B: Southbound RHVP Existing Pavement Cross Fall Analysis

EXISTING PAVEMENT CROSS-FALL
SOUTHBOUND LANES

STATION	CURVE R, e, Ls	EXISTING PAVEMENT SURVEY DATA: EDGE OF AUXILLARY LANE OFFSET from Median Centerline	EDGE OF AUXILLARY LANE ELEVATION	EDGE OF AUXILLARY LANE CROSS-FALL	OUTER EDGE OF PAVEMENT OFFSET from Median Centerline	OUTER EDGE OF PAVEMENT ELEVATION	OUTER EDGE OF PAVEMENT CROSS-FALL	CENTERLINE-SBL OFFSET from Median Centerline	CENTERLINE-SBL ELEVATION	INNER EDGE OF PAVEMENT OFFSET from Median Centerline	INNER EDGE OF PAVEMENT ELEVATION	INNER EDGE OF PAVEMENT CROSS-FALL	STATION	CURRENT STANDARD DESIGN SUPERELEVATION INNER E.P.	CURRENT STANDARD DESIGN SUPERELEVATION OUTER E.P.	COMPARISON DIFFERENCE INNER E.P.	COMPARISON DIFFERENCE OUTER E.P.
24+000		-19.282	124.927	0.0%	-15.440	124.926	1.0%	-11.680	124.887	-7.840	124.832	-1.4%	24+000	0.69%	-2.00%	0.3%	0.6%
24+020		-19.195	124.484	0.3%	-15.397	124.472	1.2%	-11.590	124.425	-7.757	124.347	-2.0%	24+020	1.87%	-2.00%	-0.6%	0.0%
24+040		-19.157	124.022	0.6%	-15.370	123.998	1.4%	-11.503	123.945	-7.743	123.863	-2.2%	24+040	2.00%	-2.00%	-0.6%	-0.2%
24+060		-19.149	123.526	0.4%	-15.325	123.512	1.3%	-11.502	123.463	-7.754	123.385	-2.1%	24+060	2.00%	-2.00%	-0.7%	-0.1%
24+080		-19.112	123.046	0.2%	-15.335	123.038	1.5%	-11.571	122.983	-7.785	122.903	-2.1%	24+080	2.00%	-2.00%	-0.5%	-0.1%
24+100		-19.139	122.593	0.5%	-15.380	122.573	1.5%	-11.601	122.517	-7.805	122.435	-2.2%	24+100	2.00%	-2.00%	-0.5%	-0.2%
24+120		-19.217	122.112	0.9%	-15.391	122.076	1.6%	-11.584	122.016	-7.780	121.951	-1.7%	24+120	2.00%	-2.00%	-0.4%	0.3%
24+140		-19.210	121.636	1.3%	-15.392	121.588	1.5%	-11.584	121.532	-7.745	121.464	-1.8%	24+140	2.00%	-2.00%	-0.5%	0.2%
24+160		-19.160	121.194	1.6%	-15.388	121.134	1.2%	-11.599	121.088	-7.718	120.998	-2.3%	24+160	2.00%	-2.00%	-0.8%	-0.3%
24+180		-19.166	120.705	1.5%	-15.355	120.648	1.3%	-11.619	120.598	-7.747	120.499	-2.6%	24+180	2.00%	-2.00%	-0.7%	-0.6%
24+200		-19.189	120.189	0.8%	-15.368	120.159	1.5%	-11.660	120.102	-7.792	120.009	-2.4%	24+200	2.00%	-2.00%	-0.5%	-0.4%
24+220		-19.223	119.692	0.5%	-15.402	119.672	1.6%	-11.656	119.613	-7.795	119.533	-2.1%	24+220	2.00%	-2.00%	-0.4%	-0.1%
24+240		-19.277	119.222	0.5%	-15.410	119.201	1.6%	-11.603	119.140	-7.792	119.059	-2.1%	24+240	2.00%	-2.00%	-0.4%	-0.1%
24+260		-19.336	118.755	0.7%	-15.466	118.729	1.7%	-11.638	118.665	-7.856	118.592	-1.9%	24+260	2.00%	-2.00%	-0.3%	0.1%
24+280		-19.406	118.293	1.0%	-15.548	118.254	1.6%	-11.694	118.191	-7.917	118.118	-1.9%	24+280	2.00%	-2.00%	-0.4%	0.1%
24+300		-19.638	117.817	1.1%	-15.571	117.771	1.5%	-11.673	117.714	-7.900	117.627	-2.3%	24+300	2.00%	-2.00%	-0.5%	-0.3%
24+320		-20.021	117.344	1.2%	-15.573	117.291	1.8%	-11.666	117.221	-7.895	117.130	-2.4%	24+320	2.00%	-2.00%	-0.2%	-0.4%
24+340					-15.691	116.809	2.0%	-11.685	116.729	-7.931	116.641	-2.3%	24+340	2.00%	-2.00%	0.0%	-0.3%
24+360					-15.761	116.308	1.7%	-11.703	116.239	-7.963	116.155	-2.2%	24+360	2.00%	-2.00%	-0.3%	-0.2%
24+380					-15.774	115.800	1.5%	-11.725	115.741	-7.970	115.667	-2.0%	24+380	2.00%	-2.00%	-0.5%	0.0%
24+400					-15.711	115.320	1.6%	-11.723	115.258	-7.931	115.177	-2.1%	24+400	2.00%	-2.00%	-0.4%	-0.1%
24+420					-15.613	114.859	0.8%	-11.666	114.827	-7.877	114.764	-1.7%	24+420	2.00%	-2.00%	-1.2%	0.3%
24+440					-15.566	114.357	0.7%	-11.720	114.331	-7.814	114.281	-1.3%	24+440	2.00%	-2.00%	-1.3%	0.7%
24+460					-15.462	113.889	0.7%	-11.544	113.862	-7.782	113.777	-2.3%	24+460	2.00%	-2.00%	-1.3%	-0.3%
24+480					-15.412	113.426	0.8%	-11.543	113.394	-7.787	113.309	-2.3%	24+480	2.00%	-2.00%	-1.2%	-0.3%
24+500					-15.368	112.955	1.0%	-11.511	112.915	-7.788	112.829	-2.3%	24+500	2.00%	-2.00%	-1.0%	-0.3%
24+520					-15.318	112.471	1.4%	-11.478	112.417	-7.750	112.324	-2.5%	24+520	2.00%	-2.00%	-0.6%	-0.5%
24+540					-15.268	111.981	1.4%	-11.426	111.928	-7.682	111.820	-2.9%	24+540	2.00%	-2.00%	-0.6%	-0.9%
24+560					-15.253	111.487	1.6%	-11.414	111.426	-7.649	111.320	-2.8%	24+560	2.00%	-2.00%	-0.4%	-0.8%
24+580					-15.280	111.008	1.9%	-11.449	110.935	-7.665	110.840	-2.5%	24+580	2.00%	-2.00%	-0.1%	-0.5%
24+600					-15.326	110.531	1.7%	-11.472	110.467	-7.700	110.367	-2.7%	24+600	2.00%	-2.00%	-0.3%	-0.7%
24+620					-15.365	110.028	1.4%	-11.494	109.974	-7.731	109.871	-2.7%	24+620	2.00%	-2.00%	-0.6%	-0.7%
24+640	R-5000m RIGHT; e=NC				-15.396	109.542	1.3%	-11.541	109.493	-7.792	109.387	-2.8%	24+640	2.00%	-2.00%	-0.7%	-0.8%
24+660					-15.417	109.076	1.4%	-11.602	109.021	-7.843	108.923	-2.6%	24+660	2.00%	-2.00%	-0.6%	-0.6%
24+680					-15.434	108.594	2.0%	-11.628	108.519	-7.865	108.437	-2.2%	24+680	2.00%	-2.00%	0.0%	-0.2%
24+700					-15.439	108.112	2.3%	-11.637	108.024	-7.847	107.942	-2.2%	24+700	2.00%	-2.00%	0.3%	-0.2%
24+720					-15.447	107.642	2.0%	-11.627	107.564	-7.818	107.479	-2.2%	24+720	2.00%	-2.00%	0.0%	-0.2%
24+740					-15.455	107.163	1.7%	-11.584	107.096	-7.814	107.014	-2.2%	24+740	2.00%	-2.00%	-0.3%	-0.2%
24+760					-15.443	106.676	1.7%	-11.568	106.612	-7.786	106.558	-1.4%	24+760	2.00%	-2.00%	-0.3%	0.6%
24+780					-15.425	106.202	1.5%	-11.597	106.145	-7.777	106.115	-0.8%	24+780	2.00%	-2.00%	-0.5%	1.2%
24+800					-15.441	105.727	1.3%	-11.612	105.679	-7.780	105.647	-0.8%	24+800	2.00%	-2.00%	-0.7%	1.2%
24+820					-15.453	105.238	1.1%	-11.608	105.195	-7.781	105.163	-0.8%	24+820	2.00%	-2.00%	-0.9%	1.2%
24+840					-15.407	104.764	0.8%	-11.548	104.735	-7.763	104.672	-1.7%	24+840	2.00%	-2.00%	-1.2%	0.3%
24+860					-15.343	104.292	0.2%	-11.509	104.284	-7.698	104.183	-2.7%	24+860	2.00%	-2.00%	-1.8%	-0.7%
24+880					-15.307	103.806	0.8%	-11.513	103.776	-7.664	103.689	-2.3%	24+880	2.00%	-2.00%	-1.2%	-0.3%
24+900					-15.296	103.314	1.7%	-11.518	103.249	-7.687	103.178	-1.9%	24+900	2.00%	-2.00%	-0.3%	0.1%
24+920					-15.364	102.822	1.5%	-11.553	102.763	-7.764	102.687	-2.0%	24+920	2.00%	-2.00%	-0.5%	0.0%
24+940					-15.482	102.349	1.5%	-11.624	102.290	-7.854	102.221	-1.8%	24+940	2.00%	-2.00%	-0.5%	0.2%
24+960					-15.526	101.884	2.3%	-11.643	101.793	-7.847	101.735	-1.5%	24+960	2.00%	-2.00%	0.3%	0.5%
24+980					-15.509	101.382	1.1%	-11.583	101.339	-7.775	101.241	-2.6%	24+980	2.00%	-2.00%	-0.9%	-0.6%
25+000					-15.498	100.925	1.5%	-11.577	100.865	-7.740	100.774	-2.4%	25+000	2.00%	-2.00%	-0.5%	-0.4%
25+020					-15.501	100.475	2.6%	-11.617	100.374	-7.743	100.335	-1.0%	25+020	2.00%	-2.00%	0.6%	1.0%
25+040					-15.353	100.017	2.3%	-11.584	99.932	-7.762	99.887	-1.2%	25+040	2.00%	-2.00%	0.3%	0.8%
25+060		-19.859	99.600	0.7%	-15.319	99.570	1.6%	-11.517	99.510	-7.749	99.415	-2.5%	25+060	2.00%	-2.00%	-0.4%	-0.5%
25+080		-19.338	99.165	1.0%	-15.303	99.125	1.4%	-11.473	99.073	-7.719	98.975	-2.6%	25+080	2.00%	-2.00%	-0.6%	-0.6%
25+100		-19.074	98.755	1.1%	-15.264	98.714	2.1%	-11.441	98.633	-7.704	98.576	-1.5%	25+100	2.00%	-2.00%	0.1%	0.5%
25+120		-18.962	98.380	0.5%	-15.235	98.363	1.7%	-11.424	98.299	-7.730	98.200	-2.7%	25+120	2.00%	-2.00%	-0.3%	-0.7%
25+140		-18.938	98.033	0.8%	-15.272	98.005	1.4%	-11.452	97.951	-7.720	97.851	-2.7%	25+140	2.00%	-2.00%	-0.6%	-0.7%
25+160		-18.808	97.699	2.2%	-15.248	97.620	1.9%	-11.501	97.547	-7.667	97.489	-1.5%	25+160	2.00%	-2.00%	-0.1%	0.5%
25+180		-18.213	97.336	2.0%	-15.144	97.276	2.8%	-11.576	97.175	-7.699	97.086	-2.3%	25+180	2.00%	-2.00%	0.8%	-0.3%
25+200		-17.216	96.972	0.5%	-15.098	96.961	2.4%	-11.539	96.875	-7.688	96.709	-4.3%	25+200	2.00%	-2.00%	0.4%	-2.3%
25+220		-16.194	96.673	-0.2%	-15.124	96.675	1.2%	-11.419	96.629	-7.616	96.449	-4.7%	25+220	2.00%	-2.00%	-0.8%	-2.7%
25+240					-15.362	96.432	1.9%	-11.410	96.356	-7.658	96.212	-3.8%	25+240	2.40%	-2.40%	-0.5%	-1.4%
25+260					-15.064	96.178	2.0%	-11.153	96.100	-7.412	95.968	-3.5%	25+260	3.33%	-3.33%	-1.3%	-0.2%
25+280					-14.629	95.954	2.4%	-10.698	95.861	-6.939	95.714	-3.9%	25+280	4.26%	-4.26%	-1.9%	0.3%
25+300					-14.109	95.739	2.8%	-10.182	95.630	-6.454	95.465	-4.4%	25+300	5.19%	-5.19%	-2.4%	0.8%
25+320					-13.942	95.525	2.9%	-9.985	95.410	-6.304	95.234	-4.8%	25+320	6.00%	-6.00%	-3.1%	1.2%
25+340					-14.022	95.319	2.5%	-10.100	95.221	-6.387	95.046	-4.7%	25+340	6.00%	-6.00%	-3.5%	1.3%
25+360					-14.279	95.141	2.6%	-10.348	95.040	-6.575	94.858	-4.8%	25+360	6.00%	-6.00%	-3.4%	1.2%
25+380					-14.598	94.992	3.6%	-10.726	94.854	-6.951	94.669	-4.9%	25+380	6.00%	-6.00%	-2.4%	1.1%
25+400					-15.026	94.875	3.5%	-11.133	94.739	-7.370	94.524	-5.7%	25+400	6.00%	-6.00%	-2.5%	0.3%
25+420	R-420m RIGHT; e=6.0%				-15.336	94.753	3.8%	-11.499	94.607	-7.637	94.370	-6.1%	25+420	6.00%	-6.00%	-2.2%	-0.1%
25+440					-15.498	94.649	4.4%	-11.650	94.480	-7.825	94.235	-6.4%	25+440	6.00%	-6.00%	-1.6%	-0.4%
25+460					-15.518	94.543	4.8%	-11.689	94.359	-7.868	94.115	-6.4%	25+460	6.00%	-6.00%	-1.2%	-0.4%
25+480					-15.391	94.413	4.6%	-11.577	94.236	-7.779	93.987	-6.6%	25+480	6.00%	-6.00%	-1.4%	-0.6%
25+500					-15.104	94.246	4.2%	-11.303	94.088	-7.527	93.851	-6.3%	25+500	6.00%	-6.00%	-1.8%	-0.3%
25+520					-14.858	94.065	3.5%	-11.046	93.930	-7.337	93.729	-5.4%	25+520	6.00%	-6.00%	-2.5%	0.6%
25+540					-14.485	93.882	2.6%	-10.634	93.783	-6.896	93.606	-4.7%	25+540	6.00%	-6.00%	-3.4%	1.3%
25+560					-14.236	93.720	1.6%	-10.288	93.655	-6.512	93.489	-4.4%	25+560	6.00%	-6.00%	-4.4%	1.6%
25+580					-13.914	93.558	1.8%	-10.039	93.489	-6.274	93.371	-3.1%	25+580	6.00%	-6.00%	-4.2%	2.9%
25+600					-13.900	93.363	0.9%	-10.126	93.330	-6.285	93.240	-2.3%	25+600	5.48%	-5.48%	-4.6%	3.1%
25+620					-14.218	93.161	0.4%	-10.330	93.147	-6.550	93.088	-1.6%	25+620	4.09%	-4.09%	-3.7%	2.5%
25+640					-14.716	92.989	0.1%	-10.803	92.984	-7.009	92.917	-1.8%	25+640	2.70%	-2.70%	-2.6%	0.9%
25+660					-15.010	92.847	-0.2%	-11.264	92.855	-7.370	92.790	-1.7%	25+660	1.30%	-2.00%	-1.5%	0.3%
25+680					-15.255	92.697	-1.1%	-11.440	92.740	-7.606	92.682	-1.5%	25+680	-0.09%	-2.00%	-1.0%	0.5%
25+700	TANGENT	-15.386	92.567	-0.9%	-15.275	92.568	-0.6%	-11.502	92.592	-7.711	92.549	-1.1%	25+700	-1.43%	-2.00%	0.8%	0.9%
25+720		-15.900	92.404	0.0%	-15.236	92.404	-0.9%	-11.470	92.438	-7.746	92.435	-0.1%	25+720	-2.00%	-2.00%	1.1%	1.9%
25+740		-16.566	92.235	-2.3%	-15.238	92.265	-0.8%	-11.479	92.296	-7.685	92.310	0.4%	25+740	-2.00%	-2.00%	1.2%	2.4%
25+760		-17.351	92.035	-2.1%	-15.165	92.081	-2.0%	-11.492	92.153	-7.675	92.186	0.9%	25+760	-2.00%	-1.63%	0.0%	2.5%
25+780		-18.091	91.850	-1.9%	-15.159	91.905	-2.1%	-11.450	91.984	-7.658	92.046	1.6%	25+780	-2.00%	-0.30%	-0.1%	1.9%
25+800		-18.804	91.655	-1.9%	-15.188	91.722	-2.2%	-11.492	91.802	-7.779	91.859	1.5%	25+800	-2.00%	1.15%	-0.2%	0.4%
25+820		-19.202	91.436	-2.2%	-15.491	91.517	-2.6%	-11.785	91.613	-8.046	91.683	1.9%	25+820	-2.63%	2.63%	0.0%	-0.8%
25+840		-19.733	91.161	-2.8%	-16.099	91.261	-3.9%	-12.347	91.407	-8.569	91.508	2.7%	25+840	-4.11%	4.11%	0.2%	-1.4%
25+860		-20.061	90.837	-4.5%	-16.410	91.000	-5.2%	-12.600	91.198	-8.854	91.343	3.9%	25+860	-5.58%	5.58%	0.4%	-1.7%
25+880		-20.151	90.580	-5.5%	-16.441	90.785	-5.9%	-12.651	91.009	-8.887	91.193	4.9%	25+880	-5.93%	5.93%	0.0%	-1.0%
25+900		-20.038	90.400	-6.2%	-16.443	90.622	-6.4%	-12.553	90.870	-8.899	91.060	5.2%	25+900	-5.93%	5.93%	-0.4%	-0.7%
25+920		-20.053	90.274	-6.3%	-16.446	90.502	-6.5%	-12.501	90.760	-8.874	90.942	5.0%	25+920	-5.93%	5.93%	-0.6%	-0.9%
25+940		-20.335	90.144	-6.4%	-16.368	90.397	-6.4%	-12.534	90.641	-8.843	90.830	5.1%	25+940	-5.93%	5.93%	-0.4%	-0.8%
25+960	R-450m LEFT; e=5.9%				-16.280	90.266	-6.8%	-12.506	90.522	-8.814	90.704	4.9%	25+960	-5.93%	5.93%	-0.9%	-1.0%
25+980					-16.394	90.137	-6.6%	-12.464	90.397	-8.759	90.599	5.5%	25+980	-5.93%	5.93%	-0.7%	-0.5%
26+000					-16.335	90.016	-6.0%	-12.477	90.247	-8.718	90.443	5.2%	26+000	-5.93%	5.93%	-0.1%	-0.7%
26+020					-16.244	89.885	-6.8%	-12.424	90.144	-8.646	90.339	5.2%	26+020	-5.93%	5.93%	-0.9%	-0.8%
26+040					-16.364	89.767	-5.5%	-12.355	89.987	-8.562	90.219	6.1%	26+040	-5.93%	5.93%	0.4%	0.2%
26+060					-16.362	89.619	-7.9%	-12.408	89.932	-8.595	90.105	4.5%	26+060	-5.93%	5.93%	-2.0%	-1.4%
26+080					-16.266	89.489	-7.5%	-12.407	89.778	-8.621	89.970	5.1%	26+080	-5.93%	5.93%	-1.6%	-0.9%
26+100					-16.260	89.375	-6.4%	-12.341	89.624	-8.581	89.854	6.1%	26+100	-5.93%	5.93%	-0.4%	0.2%
26+120					-16.226	89.254	-7.4%	-12.380	89.540	-8.681	89.732	5.2%	26+120	-5.93%	5.93%	-1.5%	-0.7%
26+140					-16.162	89.130	-6.9%	-12.409	89.390	-8.702	89.607	5.9%	26+140	-5.93%	5.93%	-1.0%	-0.1%
26+160					-16.133	89.038	-5.7%	-12.321	89.257	-8.575	89.472	5.7%	26+160	-5.93%	5.93%	0.2%	-0.2%
26+180					-15.989	88.995	-5.7%	-12.159	89.213	-8.450	89.376	4.4%	26+180	-5.93%	5.93%	0.2%	-1.5%
26+200					-15.752	88.952	-5.0%	-11.980	89.139	-8.210	89.284	3.8%	26+200	-4.57%	4.57%	-0.4%	-0.7%
26+220					-15.369	88.916	-4.3%	-11.536	89.079	-7.768	89.181	2.7%	26+220	-3.09%	3.09%	-1.2%	-0.4%
26+240					-15.179	88.877	-4.0%	-11.347	89.031	-7.567	89.088	1.5%	26+240	-2.00%	1.61%	-2.0%	-0.1%
26+260					-15.138	88.834	-3.2%	-11.369	88.956	-7.543	88.988	0.8%	26+260	-2.00%	0.13%	-1.2%	0.7%
26+280					-15.225	88.828	-1.3%	-11.423	88.876	-7.554	88.880	0.1%	26+280	-2.00%	-1.21%	0.7%	1.3%
26+300					-15.276	88.842	0.6%	-11.459	88.819	-7.559	88.822	0.1%	26+300	-2.00%	-2.00%	2.6%	2.1%
26+320					-15.315	88.827	0.2%	-11.459	88.818	-7.592	88.779	-1.0%	26+320	-1.44%	-2.00%	1.7%	1.0%
26+340					-15.369	88.793	0.6%	-11.507	88.769	-7.688	88.697	-1.9%	26+340	-0.11%	-2.00%	0.7%	0.1%
26+360					-15.361	88.766	2.4%	-11.562	88.675	-7.779	88.606	-1.8%	26+360	1.47%	-2.00%	0.9%	0.2%