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PRIVILEGED AND CONFIDENTIAL

VIA EMAIL (Nicole.Auty@hamilton.ca)

Nicole Auty, City Solicitor
Legal Services
City of Hamilton
21 King Street West, 12th Floor
Hamilton, Ontario L8P 4W7

Dear Ms. Auty:

RE: HAMILTON re: RED HILL VALLEY PARKWAY LEGAL OPINION
Your File No. Unknown
Our File No. 601-102

We confirm that you have requested us to provide you with an opinion on various matters as more fully set out below in light of the City's receipt of a FOI request related to the Red Hill Valley Parkway ("RHVP") recently discovered in reports in the City's possession which had not been disclosed on a previous FOI and the interim steps to address safety of users of the RHVP prior to the resurfacing of the highway expected to commence in June 2019.

We confirm that you have provided us with the following documents:

1. Six Year Performance Review of RHVP by Golder Associates dated January 2014;

2. Tradewind Scientific Friction Testing Survey Summary Report re: Lincoln Alexander and Red Hill Valley Parkways dated November 20, 2013

3. RHVP Detailed Safety Analysis by CIMA dated November 2015;

4. E-mail re: RHVP pavement testing results from Golder dated November 28, 2018;

5. RHVP and LINC Collision Counter-measures, undated;

6. Draft RVHP Road Safety Assessment by CIMA dated November 2018 (received from Brian Malone at CIMA);

7. FOI Request #18-189.

BACKGROUND FACTS

1. Six Year Performance Review of RHVP by Golder Associates dated January 2014

As suggested by the title, the review took place approximately six years after the completion of construction of the RHVP. It was noted that the "perpetual pavement" on the RHVP was designed to last 50 years while conventional deep strength asphalt pavements are designed for a 20 year life expectancy.

The report notes that friction testing was carried out by a subcontractor, Tradewind, on the RHVP in November 2013. Golder summarized Tradewind's findings as showing that friction testing in both the southbound and northbound lanes derived friction numbers of 34-39. Golder notes that friction values should be at least 40 to be considered adequate (Golder does not indicate where this number comes from) and that in the United Kingdom, the friction value would have to be at least 48 to be considered adequate on a highway comparable to the RHVP.

In its "Analysis and Recommendations" section, Golder notes that whereas the RHVP was originally designed to accommodate 30,000 AADT in the first year, growing to approximately 90,000 AADT by year 50, there was a dramatic increase in the amount of traffic using the RHVP. In fact, in the first six years of service, the RHVP had experienced the number of vehicle trips that would have been expected in year 12. Golder also points out that shortly after construction, there were two separate flooding incidents inundating the roadway and likely worsening the subgrade conditions, resulting in a few areas of localized depressions (this would not appear to have anything to do with the co-efficient of friction of the road surface).

2. Tradewind Scientific Friction Testing Survey Summary Report re: Lincoln Alexander and Red Hill Valley Parkways dated November 20, 2013

The Tradewind report indicates that the standard in the UK for skid resistance was 0.48 (48 friction number). RHVP had friction numbers in the range of 30-40 which was below or well below the relevant UK standard for comparable highways. In contrast, the Lincoln Alexander Parkway had friction values in the range of 50-60, all comfortably above the UK standard.

3. Red Hill Valley Parkway Detailed Safety Analysis of CIMA dated November 2015

According to CIMA, the RHVP opened in 2007, with traffic volumes ranging between 55,000 and 59,000 between 2009 and 2014. There were 474 collisions on the RHVP between January 1, 2008 and July 23, 2015, an average of 62.5 collisions per year. Median related collisions represented 28% of total collisions.

CIMA was retained to review the safety and operational performance of the RHVP and to identify measures that could potentially improve performance and reduce the number and/or severity of collisions. CIMA accordingly carried out a safety review in 2013 concerning the segment of the RHVP between Dartnall Road and Greenwood Avenue followed by a 2014 study from Dartnall Road south to the railway overpass north of Barton Street.

CIMA pointed out that there were 474 collisions during the period reviewed. There were 4 fatal collisions (5 fatalities in total), 205 personal injury collisions, 265 property damage only collisions. 33.7% of the collisions occurred during rainy weather, 58% occurred during clear weather and the remaining collisions occurred during winter weather conditions (snow, drifting snow, freezing rain). CIMA points out that compared to the provincial average of 10.9% and the overall City average of 13.4%, the proportion of collisions occurring during rainy weather was significantly higher on the RHVP. 50.4% (239 out of 474) collisions occurred when the surface of the RHVP was wet. When compared to the provincial average of 17.6% and the City average of 22%, the proportion of collisions occurring during wet road surface conditions was significantly higher. 117 out of the 208 (56%) single motor vehicle collisions, 45 out of 116 rear-end collisions (38.8%) and 56 out of 108 side-swipe collisions (51.9%) occurred in wet surface conditions.

In terms of apparent driver action, CIMA notes that 165 out of 474 collisions, or 34.8%, were attributable to "loss of control". This is reported to be five times higher than the municipal average and almost four times higher than the provincial average for that collision cause. In accidents involving wet surface conditions, the percentage increases to 38.9% of accidents attributable to loss of control.

Northbound accidents were heavily concentrated (31%) in a 600 meter section around the King Street interchange over the total 8.1 kilometer study distance. Southbound collisions tended to be on the on-ramps at three interchanges. The authors of the CIMA report also point out that the northbound accidents around the King interchange had a 4.33:1 wet surface to dry surface collision ratio and in the southbound direction, the proportion was approximately 3:1, which the authors noted exceed the normal expectation of more dry surface than wet surface collisions.

Speed studies apparently confirmed excessive speeds, with the 85th percentile speed exceeding the design speed (110 km/h) in the case of approximately 20% of drivers. It was also noted that the design speeds for some curves on the RHVP was only 100 km/h.

CIMA concludes that the potential causes of the higher than expected proportion of wet surface conditions accidents might be the following:

- Inadequate skid resistance (surface polishing, bleeding, contamination);
- Hazardous maneuvers that may be related to avoid these maneuvers or surface deficiencies (pot holes, waves, other defamation, water accumulation); and/or,
- Excessive speed.

The authors conclude that a combination of high speed and wet surface are the primary contributing factors to the excessive number of collision on the RHVP especially in the area of the interchanges where small radius horizontal curves are present.

Inadequate medians barriers (related to 28% of collisions) is cited as a potential cause of some accidents as well as acceleration lanes being too short. CIMA, however, attributes the main cause of the excessive number of accidents, particularly in wet surface conditions, as high operating speeds on the RHVP.

CIMA noted no characteristic of the type of pavement used (stone mastic asphalt) (SMA)) as contributing to the ongoing accidents in wet weather conditions.

CIMA recommended the following steps to reduce the accident frequency on the RHVP:

- Install "slippery when wet" signs with rain-activated yellow flashing beacons in areas of high wet pavement collisions and without beacons at every 1 km interval;
- Install "bridge ices" signs in advance of various bridges on the RHVP;
- Install object marker signs at various locations to denote potential impact obstacles;
- Install median barriers signs at acceleration lanes where there is a high collision history;
- Increased speed enforcement;
- Install speed feedback signs;
- Install oversized speed limits signs;
- Install permanent recess pavement markers;

- Install illumination;
- Install oversized curve warning signs for some on-ramps;
- Install merge signs;
- Trim vegetation on on-ramp/merging areas;
- Upgrade guardrail end treatments.

Ultimately, in assessing the cost and benefits, CIMA appears to have found speed enforcements and speed feedback signs as the number one benefit to cost ratio, followed by permanent recessed pavement markers.

CIMA recommended against installing illumination along the RHVP.

4. Email from Golder to the City dated November 28, 2018 re: RHVP Pavement Testing Results

The author points out that the testing was carried out in January 2018 and was presented to the City in March 2018, which the new Director of Works, Gord McGuire, was apparently unaware of.

Golder's findings with respect to the testing was as follows:

- The polished stone value was within average limits;
- The measured texture depth ("MTD") was 1.25 mm. The author notes that a pavement with good microtexture should have an MTD of about 1.0 mm. It is unclear whether the higher value found in the RHVP samples is better or worse than a finding of 1.0 mm.

5. RHVP and LINC Collision Counter-measures, undated

We have been provided with an undated chart which formed Appendix A to Report PW18008 regarding "Collision Counter-measures" on the RHVP and the Lincoln Alexander Parkway.

The "status" of Collision Counter-measures action items appear to show that most of the recommendations in the November 2015 CIMA report have been implemented, although some only in 2018.

With respect to "Slippery when Wet" signs, while it indicates that it is completed, it is not noted whether rain-activated flashing beacons were also installed in high collision areas and whether the "Slippery when Wet" signs were installed at 1 km intervals in other locations along the RVHP.

The report also notes that pavement friction testing was carried out; however, we are unaware of any pavement friction testing since 2013.

It is noted that a medium barrier system and illumination have not been installed pending further review and we understand that CIMA is currently undertaking further review of these issues for both the RVHP and the LINC.

6. Draft RVHP Road Safety Assessment by CIMA dated November 2018 (received from Brian Malone at CIMA)

The draft CIMA report reviews collision history since 2015. With respect to collisions by environmental conditions, it found that 45% occurred during rain events in the through lanes of the RHVP and 52% of ramp collisions occurred during rain events. CIMA notes that the proportion of rain environment conditions accidents is noticeably higher than that which was found in 2015 (34%). 64% of accidents were found to have occurred on a wet surface out of all through lane collisions and 73% of ramp collisions occurred on wet surfaces. CIMA notes that the proportion of wet surface conditions is notably higher than what was found in the 2015 review (50%), which was already significantly higher than the provincial and City averages, as discussed above.

With respect to the distribution of collisions, the findings were very similar to the 2015 review with respect to the high accident locations in both the northbound and southbound lanes. In those high collision areas, well over 69-82% of collisions occurred on wet road surfaces.

In the draft November 2018 report, CIMA makes the following recommendations to reduce collision frequency and severity on the RVHP:

- Install oversized speed limit signs/speed feedback signs;
- Conduct regular speed enforcement, particularly in the vicinity of the King Street and Mudd Road interchanges;
- Install or intensify the installation of Slippery when Wet signage supplemented by rain activated flashing beacons in the high collision areas;
- Install high friction pavement on approaches and through the curve on the Mudd Street on-ramp;
- Install pavement marking text and/or peripheral transverse bars on the Mudd Street on-ramp and upper RHVP west/south on-ramp, or alternatively, consider installing speed feedback signs or flashing beacons on the advisory speed signs.

The remainder of the report addresses new guiderail installations or replacement, improved guiderail end treatment and the installation of crash cushion or barrel systems

in respect of some roadside clear zones (which are not directly relevant to reducing wet road surface collisions).

7. FOI Request No. 18-189

The request for access to municipal records indicate that any document concerning friction testing on the RHVP over the last five years and any documents relating to asphalt, pavement testing, assessments and plans on the RHVP in the last two years are disclosed.

This would appear to encompass the 2014 Golder report and the Tradewind report but not the CIMA report which was neither related to friction testing or was it issued within the last two years. Any documentation relating to pavement testing such as the November 28, 2011 email to Gord McGuire will also need to be produced.

Telephone Conversation with Brian Malone on December 11, 2018

Mr. Malone spent quite a bit of time providing us with the background of CIMA's initial involvement in the study of a segment of the RHVP (Greenhill to Dartnall) In October 2013 and a second safety study covering the entire RHVP in 2015. The latter study was prompted by a couple of fatal collisions in which vehicles crossed the centre median into the oncoming lane of traffic, such that the focus of the safety review was on median crossover crashes. CIMA did, however, make more general safety recommendations and had certainly noted that there was an inordinately high proportion of accidents occurring under wet road conditions.

With respect to the recommendations CIMA made to the City, Mr. Malone is aware, from subsequent retainers to conduct further studies relating to median barriers and illumination of the RHVP, that the City did the following with respect to CIMA's November 2015 recommendations[1]:

Fully implemented	– Enhanced speed enforcement
	– Oversized speed limit signs
	– Oversized curve warning signs
	– Bridge ices signs
	– Guide wire end treatments
Partially implemented	– Slippery when wet signs (but not placed at 1 km intervals)
	– Trimming of vegetation (one time; not ongoing)

[1] These recommendations are set out in p. 50, section 9.2 of its November 2015 report.

	– Merge signs
	– Guardrail end treatments
Not implemented	– Rain activated flashing lights on slippery when wet signs in high collision areas
	– Speed feedback signs
Implementation unknown	– Pavement friction testing

For the purpose of the follow-up median barrier study for which CIMA was retained this year, CIMA was provided with updated collision records up to the end of 2017. Despite the implementation of some of the recommendations made by CIMA, there was no significant change in collision history or the tendency of collisions to be occurring inordinately in curves during wet road surface conditions.

When asked to rank, in order of greatest contribution, to the inordinate number of wet road crashes, Mr. Malone advised as follows:

- Slipperiness of the road surface (ie. the road is slipperier when wet than other roads which leads to greater accidents then on roads with similar large numbers of horizontal curves in wet road conditions);
- Speeds exceeding the capability of the highway given the curvature of the road;
- Curves in the road (there are a number of sharp curves having design speeds of 100 km/h, whereas a high proportion of vehicles are substantially exceeding that speed);
- The close proximity of on/off-ramps to each other leading to losses of control and/or drivers' errors as traffic attempts to merge onto the highway or cut across lanes to get off the highway.

With respect to the surface treatment of the RHVP, being SMA, he explained that this material has large pieces of aggregate and less fines and smaller stones compared to conventional asphalt. In a spectrum which has the kind of asphalt used for private driveways being the smoothest with the finest granular mix and tar and chip being the roughest in terms of having the largest aggregate, SMA would be toward the tar and chip end of the spectrum.

He believes that City chose SMA because it produces a lower noise volume than conventional asphalt and it is expected to last at least twice as long as conventional asphalt before needing to be replaced.

SMA has been known to initially have poor slip resistant because asphalt coats the large aggregates but the slip resistance improves to at or better than conventional asphalt as the asphalt wears off the aggregate and provides the surface with more friction for vehicles' tires. Because of the large aggregates, however, SMA holds much more water on the road that does not drain away than conventional asphalt because the water sits in pockets between the large aggregates, creating "micro-ponds". He speculates this is the reason for the high number of accidents on the RHVP in combination with the high number of curves and excessive speeds at which the highway is driven.

SMA is used in Europe and in the southern United States; however, it is largely experimental in Ontario and Canada generally.

Telephone Conversation with Brian Malone on February 1, 2019

You, Mr. Szabo, Dan McKinnon, Gord McGuire and a number of other Public Works staff had a telephone conversation with Brian Malone on February 1, 2019 to discuss his preliminary findings.

The most significant comments Mr. Malone made in the course of that conversation were as follows:

- In light of reviewing the 2013 and 2017 Golder reports, Mr. Malone did not believe that any additional safety initiatives were required beyond those recommended in CIMA's previous reports (and largely implemented by the City);

- Mr. Malone did not believe that reducing the speed limit on the RHVP was necessary or appropriate; he did, however, strongly recommend enhanced enforcement of the existing speed limit;

- Mr. Malone did not believe that it was advisable to shut down the RHVP pending the repaving this Spring;

- In concluding that friction levels were below accepted industry standards, Tradewind relied on a chart which is not accepted within the traffic engineering industry. Applying the industry-accepted friction chart as well as the TACC geometric design guideline, friction levels on the RHVP were at levels that met accepted design guidelines and were at a level that warranted "investigation" but not immediate "intervention";

- Mr. Malone's primary concern with friction readings on the RHVP was that they were significantly lower than friction levels on the Lincoln Alexander Parkway (and quite likely also surrounding MTO highways like the QEW) such as to create expectations on the part of users of available friction of the road surface on the

RHVP based on use of these other, similar roadways that was not in fact available on the RHVP.

ISSUES

You have asked us to comment on the following issues:

1. Risk Management/Liability Issues Arising Out of the Findings Concerning the RHVP
2. Response to FOI Request
3. Assistance with Dealing with the Media and Council

DISCUSSION

1. Risk Management/Liability Issues Arising Out of the Findings Concerning the RHVP

a. Significant Findings From Experts' Evaluations of the RHVP

There was an indication in 2013, 6 years after the RHVP opened, that the friction of the RHVP was below the standard applicable to an Ontario road authority like Hamilton. No reason was suggested for that finding at that time and the 2018 pavement testing does not appear to have revealed any issues with the construction of the highway that would account for these findings.

The 2015 CIMA report identified a significant accident history, particularly with wet road conditions; however, it appeared to primarily attribute this problem to excessive speed. CIMA did, however, suggest other measures to attempt to avoid accidents, and minimize the severity of accidents that did occur. CIMA provided a prioritized list of measures that could be taken based on a cost/benefit analysis and, in some cases, solely the cost of the measure. CIMA also identified discrete locations both northbound (King St interchange) and southbound on-ramp at (3 different interchanges) where wet road related collisions were particularly high. Significantly, CIMA made recommendations specifically directed at wet road related accidents, including posting Slippery When Wet signage at 1 kilometre intervals throughout the length of the RHVP and adding rain-activated flashing beacons to such signs in the areas identified where there was a particularly high incidence of wet road related accidents.

In conversation with Mr. Malone this week, he identified road surface conditions as the most significant factor in the high incidence of wet road related accidents. He further identified the tendency for "micro-ponding" with MSA roads as a likely factor in the increased incidence of wet road related accidents. Although the CIMA report dated November 2015 did identify road surface conditions as a factor in the wet road related collisions, it did not recommend any measures, such as resurfacing the road in the high wet road collision areas with a more slip resistant surface, to specifically address the problem with the slippery road surface, and it did not identify any particular problem

with the road that could be addressed to improve the friction of the road surface. As noted above, however, CIMA did recommend extensive Slippery When Wet signage, with flashing beacons in high collision areas.

b. The City's Response to the Experts' Findings and Recommendations

Critical to the City's potential liability exposure to claims related to wet road related collisions is its response to the consultants' reports reviewed above.

In our opinion, the friction testing in 2013 provided no basis, in and of itself, for any action to be taken, partly because Golder made no recommendations to the City about addressing the issue, and also because the "40" friction number apparently has no basis in industry standards recognized in Ontario (per our conversation with Brian Malone).

The 2015 CIMA report, on the other hand, made clear that there was a serious issue with wet road related accidents and identified specific responses to address this problem based on the factors they identified as being relevant to this collision experience (oversized speed limit signs; Slippery When Wet signs at close intervals and flashing, rain-activated beacons in high collision areas; and merge signs at significant interchange collision areas).

In our opinion, given the serious findings set out in the CIMA report dated November 2015 regarding wet road related accidents, it was incumbent on the City to implement all of the recommendations related to signage recommended in the CIMA report, and to further implement any additional wet road surface collision mitigation recommendations CIMA has made in its draft November 2018 report. Mr. Malone has advised that his understanding is that while oversized speed limit signs were installed and some Slippery When Wet signs were installed, they were not installed at the distance intervals recommended by CIMA and the recommendation regarding rain activated flashing beacons on Slippery When Wet signs on approaches to high wet road related collision areas was not followed. These omissions could open the City to potential liability exposure if Mr. Malone's recollection is accurate. In addition, any failure to install Merge signs in a timely fashion, which CIMA suggested could reduce collisions generally, including in wet road situations, could be problematic. It is imperative that the City identify to what extent it implemented the specific recommendations suggested by CIMA regarding these signs/warnings, and what reasons it had for not implementing recommendations that it did not implement. Lack of good reason to implement the recommended mitigating steps would increase the City's liability exposure.

While it is tempting in hindsight to suggest that the City ought to have at least resurfaced the portions of the RHVP identified by CIMA as being the high risk areas for wet road related collisions to provide more slip resistance (northbound, in the vicinity of the King Street interchange; southbound, at the three interchanges identified in the CIMA report and on high collision ramps), no consultant made any such recommendation[2], and

[2] We note that this recommendation is now being made in CIMA's draft November 2018 report in respect of two of the on-ramps.

in our view, it was reasonable to attempt less costly measures as recommended by CIMA before considering such a costly option. More detail regarding the cost of that work would be useful in evaluating the reasonableness of the City's decision in that regard.

c. Potential Liability Concerns

There is potential liability exposure on the City to the extent that it did not implement all of the recommendations set out in the November 2015 CIMA report in the absence of good reason for not doing so. To the extent that the findings of the CIMA report are made public, it may prompt claims for contribution and indemnity in respect of motor vehicle accidents subsequent to the release of that report and it may prompt new actions from motorists that had accidents in wet road conditions, particularly in the case of single motor vehicle accidents, that have occurred since the City received and had a reasonable time to implement the recommendations in the November 2015 CIMA report.

Even as to accidents that occurred more than 2 years ago, plaintiffs will have an argument that they only "discovered" their cause of action against the City upon learning of the 2015 CIMA report identifying inadequate road surface conditions as a factor in loss of control accidents in wet road conditions, assuming that its existence becomes public.

d. Potential Claims for Contribution and Indemnity by the City

The MSA treatment of this road, at least in hindsight, may have been inappropriate. Despite the benefits of reduced noise and extended longevity, given that the RHVP has significant curves, the design speed of some of which are less than the design speed of the road generally, and the significant grade changes throughout its length, a road that has been prone to heightened slipperiness in wet road conditions may not have been a prudent choice for this particular road application.

If there were any consultants that recommended the MSA road surface treatment in these circumstances, there may be liability on said consultant, depending on the following factors:

- The state of knowledge of "micro ponding" on MSA roads as of the period when the decision to go with that treatment was determined;

- The consultant's knowledge of the intended (as designed and constructed) horizontal and vertical geometry of the road at the time that the MSA treatment was recommended.

e. Risk Management - Mitigating Steps Pending Anticipated June 2019 Resurfacing of RHVP

You have advised that the City plans to re-surface the entire length of the RHVP commencing in May/June 2019, at a cost of ~$215 Million.

In our opinion, the City should immediately implement all of the CIMA recommendations from its November 2015 report (including slippery when wet signage with rain-activated flashing beacons in high accident areas and spacing of such signs at 1 kilometer intervals in other areas) and any additional recommendations in CMA's draft November 2018 report to the extent it has not already done so in order to reduce its exposure to liability for any accidents taking place prior to the resurfacing next year.

2. Response to FOI Request

As indicated above, based on the parameters of the FOI request recently received, the Golder report dated January 2014, including the Tradewind report appended to the Golder report (concerning the friction testing) needs to be disclosed. The email dated November 28, 2018 from Golder to Gord Maguire must also be produced given the parameters of the most recent FOI request.

We are of the opinion that the CIMA report dated November 2015 does **not** have to be produced based on the most recent FOI request.

We are advised that there was a FOI request in or about the Summer of 2018 which requested information concerning the RHVP, the response to which did not include the Golder, Tradewind and CIMA reports discussed herein. We have not been provided with a copy of that FOI but we would be pleased to comment on the sufficiency of disclosure pursuant to that request upon receipt of the request and particulars of the disclosure provided.

We have reviewed the exclusions to production in MFIPPA to determine whether a refusal to produce any of the documents we have been provided with can be justified. In our view, there is no basis for refusing disclosure of any of these documents.

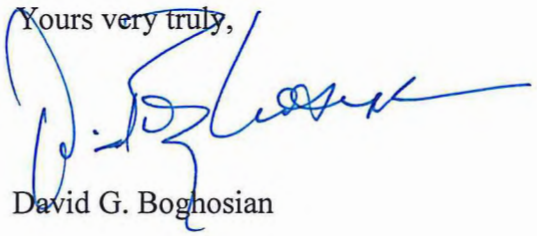
CONCLUSIONS

We believe our comments and recommendations as set out above are self-explanatory

We look forward to receipt of the additional documents and information such that we can complete our opinion.

Should you have any questions or require any further elaboration, please do not hesitate to call or email the undersigned.

Yours very truly,



DGB/ka

David G. Boghosian