RED HILL VALLEY PARKWAY INQUIRY

AFFIDAVIT OF BYRDENA MACNEIL (affirmed March 15, 2023)

I, BYRDENA MACNEIL, of the City of Hamilton, Ontario, in the Province of Ontario, **MAKE OATH AND SAY:**

1. I was a Solicitor in the Legal & Risk Management Services Department ("Department") in the Corporate Services Division with the City of Hamilton ("City") from April 2006 until December 2020. As such I have knowledge of the matters set out below, except where this knowledge is based on information and belief, in which case I state the source of that information and verily believe it to be true. This affidavit is based on my recollection of events and my review of records provided to me through the Inquiry process.

2. In my role as a Solicitor at the City, I worked within the Dispute Resolution section and reported to the Deputy City Solicitor (Dispute Resolution), Ron Sabo. I worked on a variety of litigation matters other than personal injury litigation (which I did not work on beyond my first few years at the City), and also provided general legal advice to other City departments, referred to as "client departments". I was one of two or three lawyers at the City who handled files relating to freedom of information ("FOI") requests pursuant to the *Municipal Freedom of Information and Protection of Privacy Act* that required more legal involvement. My involvement with FOI requests was typically to assist client departments to prepare submissions to the Access & Privacy Office, including providing

information on potential exemptions or answering questions raised by the Access & Privacy Office. The Access & Privacy Office is ultimately responsible for determining whether responsive records are released to requestors.

3. To the best of my recollection, I did not have carriage of any Red Hill Valley Parkway ("RHVP")-related litigation or other files prior to November 2018. I do not recall having any other involvement in such litigation prior to November 2018. I was aware of RHVP-related litigation based on informal discussions with other Solicitors in Dispute Resolution and through media coverage, but I did not have detailed information regarding any claims.

4. Throughout my involvement set out below, I was focused on giving advice in respect of the response to an FOI request that was identified as FOI 18-189. Although I came to understand that the release of the Tradewind Report through FOI 18-189 may pose liability or reputational impacts for the City, I did not view my role as giving advice on those issues. I understood the consequences of the release of the Tradewind Report were being handled by those senior to me in the Department, and by Public Works and other senior staff. I also understood that any assessments of possible safety issues arising from the content of the Tradewind Report and Golder Report were not my responsibility and were being handled by Public Works staff.

Initial Contact Regarding FOI 18-189

5. I first became aware of an FOI request relating to friction and asphalt testing on the RHVP ("FOI 18-189") at or around the time I received an email from Mr. Sabo regarding FOI 18-189 on November 9, 2018 (HAM0061832_0001). Around the same time

when I received Mr. Sabo's email, Mr. Sabo came to my office and advised me that there was an FOI request for which my assistance would be needed. I do not recall him providing me with any details regarding the FOI request at the time. I understood from Mr. Sabo's email that Gord McGuire was anxious about FOI 18-189, but I did not receive further information about the reason for his anxiety at the time.

6. I recall having a brief conversation with Debbie Edwards, Deputy City Solicitor (Commercial, Development and Policy), regarding FOI 18-189 (and emails I have reviewed indicate this occurred on or about November 12, 2018) but do not have a specific recollection of the details of that discussion. I understood from Ms. Edwards that Mr. McGuire had initially contacted her regarding FOI 18-189, and that he was anxious about it. I do not recall being provided with any additional details regarding Mr. McGuire's anxiety or the nature of FOI 18-189 at this time. Based on my practice regarding FOI requests, I likely asked Ms. Edwards if she had any documents that I should review, but I do not have a specific recollection of this discussion (HAM0062475_0001).

7. I do not recall being told by Ms. Edwards or Mr. Sabo that either of them had previously spoken with Mr. McGuire regarding the RHVP in October 2018.

8. Before receiving any documents relating to FOI 18-189, I believe I received a copy of the information sheet describing what documents were being requested. I did not understand initially that there was any particular significance to FOI 18-189 and expected my involvement to be typical to other FOI requests that I assisted with (i.e., to assist the client department to prepare the submission to the Access & Privacy Office, including identifying potential exemptions).

9. I believe I first received and reviewed documents relating to FOI 18-189, including the Tradewind Report, when they were sent to me by Mr. McGuire on November 11, 2018 (HAM0027442_0001, attaching HAM0027443_0001, HAM0027444_0001, HAM0027445_0001, HAM0027446_0001, HAM0027447_0001, HAM0027448_0001, HAM0027449_0001, HAM0027450_0001, HAM0027451_0001, HAM0027452_0001, HAM0027453_0001, HAM0027454_0001, HAM0027455_0001, HAM0027456_0001 and HAM0027457_0001). I do not recall when I first spoke to Mr. McGuire regarding the RHVP, including whether it was before or after I received the initial set of documents on November 11, 2018.

10. I first received a document titled "Red hill review GMC Summary.doc", which was a summary and chronology of issues relating to the RHVP ("GMC Summary"), as part of the email from Mr. McGuire (HAM0027452_0001). Reviewing the GMC Summary provided me with further context regarding Mr. McGuire's anxiety relating to the FOI request. I understood Mr. McGuire to be concerned that the Tradewind Report seemed to differ from what Council, the Hamilton Spectator, and the public had previously been told regarding the RHVP, and from what he himself previously understood. I do not recall if Ms. Edwards previously provided me this information, or if I was otherwise aware before reviewing the GMC Summary.

11. I do not have a recollection of my first meeting with Mr. McGuire regarding the RHVP, or whether it occurred on November 12, 2018 (HAM0061834_0001).

12. I do not recall attending a meeting on November 13, 2018, with Mike Zegarac, Dan McKinnon and Mr. Sabo, for which I received a calendar invite with the subject line

"URGENT - Mike Zegarac / Dan McKinnon / Ron Sabo / Byrdena MacNeil re MFIPPA re Expressway" (HAM0061981_0001). I would not typically be included or expect to be included in meetings of this nature, since Mr. Zegarac, Mr. McKinnon and Mr. Sabo were more senior than me. I would typically only be included in such meetings if they required information from me.

13. Shortly after reviewing the Tradewind Report, I formed the view that the Tradewind Report was likely to be disclosed pursuant to FOI 18-189 because I did not think that there would likely be any successful exemptions to its disclosure. However, I wanted to gather more information to confirm my understanding and advice on whether the Tradewind Report would need to be disclosed.

14. While working on FOI 18-189, I was cognisant of the need to keep Mr. Sabo aware and up to date regarding its status. I did so because of the sensitivity of the file, and because the Tradewind Report may have an impact on the City's liability, in light of the positions the City had previously taken or information that it had previously released regarding the RHVP. I also wanted to update Mr. Sabo because I knew he was involved in discussions with more senior City staff in which I did not participate. I did not see Mr. Sabo every day, so my practice was to forward and send him emails to keep him updated.

15. My assistant, Pam Delry, opened a file related to FOI 18-189 on November 20, 2018. It was assigned matter number 18-1054 ("Matter 18-1054"), which was separate from the work Ms. Auty and Mr. Sabo were undertaking related to liability or reputational concerns regarding the RHVP. I have attached to my affidavit the file opening sheet prepared by my assistant for Matter 18-1054 as **Exhibit A** (HAM0064436_0001). My

practice at the time, as I recall, was to have a separate subfolder within my electronic files on the City's server where I stored documents for each matter to which I was assigned. I also had designated filing cabinets for hard copy documents.

16. Each lawyer in the Department had their own separate electronic storage system on the City's server. I did not use my electronic storage system communally or collaboratively, except my assigned law clerk and legal assistant would access it, as needed; if I was working with another lawyer on a particular matter or document, we used our respective storage systems to work on and save documents, and used email to transmit and share documents with one another. For example, Mr. Sabo and Ms. Auty would not have used my subfolder for Matter 18-1054 to save their own documents or emails, even for work related to the RHVP or FOI 18-189. While I do not recall if we could access the electronic storage systems of other lawyers in the Department, it was not typical practice to do so.

Request for Extension for Response to FOI 18-189

17. I generally recall having discussions with Mr. McGuire about needing an extension to respond to FOI 18-189. I understood that an extension was needed because the Access & Privacy Office had given a short time frame to respond to the request, and additional time would be needed to locate, review and discuss potentially responsive documents.

18. Shortly after I became involved, I called Anne Watson in the Access & Privacy Office to discuss obtaining an extension, and she told me that the request for an extension should be put in writing. I recall having a discussion with Mr. McGuire about the written

request for an extension. Based on the language used in the written request Mr. McGuire submitted to Ms. Watson on November 14, 2018, I believe that it is likely that I either redrafted the written response Mr. McGuire sent me earlier the same day for my review or provided him with language to revise it before he provided it to the Access & Privacy Office (HAM0061982_0001, HAM0061983_0001, HAM0061851_0001 and HAM0061852_0001). I have attached to my affidavit the written request submitted to the Access & Privacy Office on November 14, 2018, as **Exhibit B** (HAM0061852_0001).

19. I do not recall if at or around this time, November 14, 2018, Mr. McGuire and I discussed that the Tradewind Report applied a UK standard, but I recall that at some point Mr. McGuire raised with me that he understood that there was no Canadian friction standard.

20. I recall that at some point, Mr. McGuire advised me that consultants were performing ongoing work regarding the RHVP, but I do not recall if those discussions had occurred by November 14, 2018, or if Mr. McGuire provided me any details regarding the consultants and/or the nature of the work that was being undertaken.

21. I recall that Mr. McGuire had a scheduled vacation from November 15 to 26, 2018. I believe we spoke about FOI 18-189 prior to his vacation, but I do not recall the details of any such discussion(s). Emails I have reviewed indicate that I spoke to Mr. McGuire by phone on November 14, 2018, but I do not recall the details of what we discussed on this call (HAM0064447_0001). I have attached to my affidavit a compilation of documents, including an email exchange I had with Mr. McGuire and Diana Cameron regarding the call on November 14, 2018 as **Exhibit C** (HAM0064447_0001).While Mr. McGuire was

on vacation, I reviewed the documents I had been provided up to that time. I expected to receive additional documents upon his return.

Contact with Risk Management and City Solicitors Regarding the Tradewind Report

22. I emailed John McLennan on November 13, 2018, attaching a copy of the Tradewind Report (HAM0053823_0001 attaching HAM0053824_0001). I contacted Mr. McLennan at that time because I knew there was or had been RHVP-related litigation and I expected that Mr. McLennan would be involved based on his role as Manager of Risk Management. I do not recall if I was aware if there was any ongoing litigation at that time. Though I do not recall the details of our discussion(s) regarding the Tradewind Report, I wanted Mr. McLennan to be aware of FOI 18-189, and recall telling him that I believed the Tradewind Report appeared responsive to the FOI request and would likely be released to the requestor.

23. I do not recall if on or around November 13, 2018, I had spoken to Mr. McLennan about whether the Tradewind Report was included in any affidavits of documents that had been produced in any RHVP-related claims. I recall generally around that time that Mr. McGuire and I were trying to reach out to staff who might have had more information about the Tradewind Report, particularly because the Tradewind Report had been attached to the Golder Report, which I had noted was marked with a draft stamp. I wanted to ensure we were making informed decisions, and we did not know if the Golder and Tradewind Reports were previously produced in litigation, if they were finalized or if there was any subsequent friction testing. I was trying to collect all that information, both through Mr. McGuire, as well as through my own inquiries in the Department, to understand the history of the Tradewind and Golder Reports. I have a general recollection

of speaking to Mr. McLennan about this at some time, but do not recall the details of that discussion or when it occurred.

24. I do not recall my initial discussion with Nicole Auty about the FOI request, the Tradewind Report or RHVP-related issues. I recall that at some point, I went to Ms. Auty's office and told her that there was a report that was likely to be released via an FOI request, and that the report may not be in line with what I understood that Council, the public and other City employees may have been led to believe (that is, that there was no problem with the safety of the RHVP's asphalt). I did not report directly to Ms. Auty, and do not recall why I spoke to her on that occasion. Based on my practice, I would not have spoken with Ms. Auty unless Mr. Sabo directed me to do so, Mr. Sabo was unavailable, or Ms. Auty was already involved in the file and had instructed me to keep her updated.

25. At some time prior to December 3, 2018, I recall Ms. Auty telling me that she understood Mr. Sabo and/or Mr. McLennan may have known about the Tradewind or Golder Reports, as they may have previously been produced in the course of litigation. I do not recall if I asked Ms. Auty, Mr. McLennan or Mr. Sabo what litigation they were referring to, and have no recollection of a discussion regarding any such litigation.

26. I recall speaking with Dana Lezau, one of the City Solicitors who handled RHVP-related litigation, at some time after speaking to Mr. McLennan; a review of the Inquiry's records shows my conversation with her was on or around December 7, 2018 (HAM0062010_0001). I decided to first speak with Mr. McLennan, rather than other solicitors in the Department, as I thought it was best for him, Ms. Auty and/or Mr. Sabo to have initial contact with any of the lawyers involved in RHVP-related litigation, including

Ms. Lezau. I did so because I did not want to influence or impact anything related to the litigation. I spoke with Ms. Lezau because I learned that she had recently completed discoveries in an RHVP-related claim. Following our discussion, I reviewed the affidavit of documents in that matter because I wanted to know what documents were produced for two reasons. I wanted to know if the Tradewind Report was produced in that matter, as this would be relevant in determining whether the Tradewind Report should be disclosed pursuant to FOI 18-189. I also wanted to see if there were any additional records that may be responsive to FOI 18-189. The Tradewind Report was not included in those productions. I did not have further discussions with Ms. Lezau to confirm why it had not been.

27. I have no independent recollection of the contents of the affidavit of documents that I reviewed following my discussion with Ms. Lezau. If, as had been suggested to me, HAM0064439_0001 and HAM0064440_0001 comprise Marco Oddi's May 3, 2018 affidavit of documents in the Hansen v. Bernat matter, I assume that was the affidavit of documents that I reviewed. I would have asked Ms. Lezau if I could review Mr. Oddi's affidavit of documents, but apart from that, I do not recall how I came to obtain it from Ms. Lezau. I do not recall when I first reviewed it, nor do I recall if I reviewed all of the documents in the affidavit of documents in detail. I have attached to my affidavit a copy of HAM0064439_0001 and HAM0064440_0001, which I reviewed in preparation of this affidavit, as **Exhibits D and E**.

28. I did not have similar discussions with Daniell Bartley, another City Solicitor who handled RHVP-related litigation or Shillingtons, one of the firms acting as the City's

external legal counsel, while I was trying to identify relevant documents for FOI 18-189. I do not have a recollection of any discussions with Mr. Bartley or Shillingtons related to the RHVP. I do not recall if I was aware that Shillingtons, or external legal counsel more generally, had a copy of the Tradewind Report before my review of documents in preparation for this Inquiry.

29. In preparing this affidavit, I have been asked whether I considered if any documents in the affidavit of documents other than the 2013 CIMA Report ought to have been included in response to FOI 18-189. I have no recollection of reviewing the staff reports addressed to the Mayor, the Council or the Public Works Committee, including a March 24, 2017 report submitted by Martin White (HAM0064440_0001 at images 126-128) and a May 19, 2017 report submitted by John Mater (HAM0064440_0001 at images 152-156). I do not recall noting that both of those reports marked “Conduct Pavement Friction Testing” as having been completed. I do not recall being aware of that information from any source other than Mr. Oddi’s affidavit of documents. I further do not recall Mr. McGuire or anyone else informing me that Council had been advised in 2017 that friction testing had been completed after December 2015.

30. Any public staff reports to Council or to the Public Works Committee would already have been available to the public without an FOI request. However, I did note to Mr. McGuire in my email to him of December 16, 2018 at 9:38 PM (HAM0053999_0001), and in Note 2 at the bottom of the FOI #18-189 – Index Identifying Possible MFIPPA Exemptions chart (HAM0062021_0001), that his office should collect and send any Committee and Council reports dealing with (i) friction of RHVP (2013-2018) and (ii)

asphalt and/or pavement of RHVP (2016-2018) to Anne Watson in response to FOI 18-189. I do not recall discussing this with anyone. Although my December 10, 2018 (12:17 PM) email to Nicole Auty, Ron Sabo and John McLennan indicates that I had some type of discussion with Mr. McGuire, what is written in the emails constitutes my past recollection recorded (HAM0062010_0001).

31. I do not recall providing the affidavit of documents to Mr. McGuire or anyone else.

December 3, 2018 Meeting

32. I recall meeting with Mr. McGuire and Ms. Cameron in Mr. McGuire's office on December 3, 2018. It is the first substantive discussion I recall having with Mr. McGuire regarding the RHVP. By this time, Mr. McGuire had provided me with the materials he had collected to date, and I had reviewed the materials I had been given. The purpose of the meeting was to discuss the documents and their significance, as well as to understand what was still outstanding before Mr. McGuire could submit his response to the Access & Privacy Office.

33. I recall that Ms. Cameron took notes. Through the Inquiry's process, I learned the meeting was recorded, but at the time of the meeting, I was not aware it was being recorded.

34. My primary contact in Public Works was Mr. McGuire. I do not recall if I had spoken to Mr. McKinnon or Mr. Zegarac by the time of this meeting on December 3, 2018. I considered Mr. McGuire to be my "client", the person giving me instructions and the person I was advising in respect of FOI 18-189. I do not recall having any communications with Mike Becke, from whom Mr. McGuire was also seeking documents that could

potentially be responsive to FOI 18-189. I offered to contact Mr. Becke regarding obtaining the applicable materials but did not do so because Mr. McGuire did not ask me to. I do not recall contacting Edward Soldo or others in Public Works about FOI 18-189, as Mr. McGuire knew the relevant individuals and was able to provide me the necessary information.

35. I do not recall whether Mr. McGuire or I first identified the Tradewind Report, the Golder Report, the 2015 CIMA Report and the November 28, 2018 email from Dr. Uzarowski to Mr. McGuire as the "key reports" as referred to during and after the December 3, 2018, meeting.

36. I do not believe I was aware of the 2013 CIMA Report at the time of the December 3, 2018 meeting, and do not recall it being discussed during the meeting. I believe I learned about the 2013 CIMA Report at some time later, when I reviewed the affidavit of documents for the file for which Ms. Lezau had completed discoveries (HAM0053999_0001).

37. I recall that Mr. McGuire told me that CIMA was doing some ongoing work for the City at this time, but I do not recall if I knew any details regarding this work. I would only have known whatever information Mr. McGuire provided me. I may have provided information regarding CIMA's ongoing work to Mr. Sabo and/or Ms. Auty, but do not recall any specific discussions regarding this.

38. During the December 3, 2018 meeting, Mr. McGuire explained to me that Golder had recommended microsurfacing in the Golder Report, but that it was not completed. I had reviewed the Golder Report and the GMC Summary before the December 3, 2018

meeting. However, I do not recall if, prior to the meeting, I had taken note that Golder had recommended microsurfacing as a possible way to address friction issues in the Golder Report.

39. During this meeting, Mr. McGuire also explained to me the concept of hot-in-place recycling and that the City had been considering using it, and expressed his confusion that this concept was considered given the concerns raised in the Tradewind Report about the quality of the material used. I do not recall whether I conveyed this information to Ms. Auty or Mr. Sabo after this meeting.

40. I do not recall if, after the December 3, 2018 meeting, I discussed Golder's 2014 microsurfacing recommendation or the City's assessment of hot-in-place recycling of the pavement materials with Ms. Auty and/or Mr. Sabo. I do not recall if I turned my mind at this time to any possible liability flowing from Golder's recommendation for microsurfacing. I was focused on my task, which was giving advice in respect of the response to FOI 18-189. I did not view myself to be the conduit of this information from Mr. McGuire to my colleagues in the Department. At this time, I understood that Public Works staff was addressing the safety of the RHVP.

41. I do not specifically recall discussions with Ms. Auty or Mr. Sabo about potential interim safety measures the City was implementing pending resurfacing. I recall thinking that potential interim safety measures was a topic that needed to be considered, and I may have discussed this with Ms. Auty and/or Mr. Sabo, but I have no specific recollections of doing so. Had I been concerned that there was an outstanding safety issue on the RHVP, I would have advised them of this, but I believed from my discussions

with Mr. McGuire that he and Public Works staff were handling the safety aspect of the RHVP. I was not asked for and did not give legal advice about the sufficiency of the steps Public Works staff were taking to assess the safety aspect.

42. I recall Mr. McGuire raising a potential conflict of interest resulting from the personal relationship between Brian Malone at CIMA and Betty Matthews-Malone who was previously a director at the City. I subsequently advised Ms. Auty and Mr. Sabo of this so that they were aware of the potential conflict (HAM0062010_0001). The decision as to whether CIMA should continue to be involved in light of the potential conflict was to be made by someone other than me and I do not have further information about that.

43. I first learned that Public Works was going to be bringing other RHVP-related reports to Committee and Council during the December 3, 2018 meeting.

44. I do not recall if, by the time of this meeting on December 3, 2018, I had spoken to Ms. Auty and/or Mr. Sabo about informing Council about the Tradewind Report. My general understanding was that Council would need to be informed, and that decisions would need to be made about how best to inform Council. I was not responsible for such decisions. I believed that responsibility rested with Public Works, with input from others in the Department. My primary focus was the response to FOI 18-189. In my view, informing Council about the Tradewind Report was independent of responding to FOI 18-189, but I understood there was some overlap. Because of this overlap and so that a report to Council could be appropriately timed, I kept Mr. Sabo and Ms. Auty updated about the status of FOI 18-189 and expected that Mr. McGuire was doing the same with his superiors.

45. I was not involved in discussions that finally determined the timing to report to Council and understood that the decision was to be made by more senior staff such as Ms. Auty, Mr. Sabo, Mr. McKinnon and Mr. McGuire. I do not recall if Ms. Auty and/or Mr. Sabo conveyed any urgency regarding bringing the information to Council before materials were released pursuant to FOI 18-189. I felt everyone was respectful of the FOI process and understood that we were doing everything as quickly as we could.

46. I have a general recollection that the senior leadership team (i.e., Mr. Zegerac, Ms. Auty, Mr. Sabo and Mr. McKinnon) needed to know about the timing of the release of the materials pursuant to FOI 18-189 in the context of the timing of the disclosure to Council. Bringing a report to Council can take a substantial amount of work in terms of drafting and review, and also consideration to determine the appropriate meeting at which it is going to be presented. If I recall correctly, at that time, there was a new Council following the municipal election in October 2018, and that prior to the election there was a pause period which limited what could be brought before Council. This meant there were a lot of other reports lined up to go before the new Council. As of December 3, 2018, there were still many moving parts, and Mr. McGuire and I were still trying to piece information together while working on the response to FOI 18-189; in my view, a report disclosing the Tradewind Report to Council could not be brought to Council until we had more information.

47. Through my involvement in the response to FOI 18-189, I was trying to determine whether there was a final report (since the Golder Report was marked with a draft stamp) or some other answer regarding the information in the Tradewind Report. At some time,

I became aware that the Golder Report remained in draft and had not been finalized. I do not have a specific recollection of receiving this information, but expect that Mr. McGuire advised me of this. In my mind, although I was never advised of an explanation about why the Tradewind Report had not been previously brought to Council's attention, it needed to be brought to Council's attention in a timely way. If the information was going to be released via the FOI process, staff would want to present their report to Council as soon as possible so that Council members would not be in a position where they were reading about it for the first time in the newspaper.

48. I do not recall the details of any further discussion with Mr. McGuire at the end of the December 3, 2018 meeting after Ms. Cameron left the room (RHV0001011).

49. Following the December 3, 2018 meeting, Mr. McGuire and I were expecting to receive and review documents from Mr. Becke. I was tasked with preparing a summary of any exemptions that could apply, given the context, background and significance of the documents provided to me by Mr. McGuire as of that date. My focus was to complete my work on FOI 18-189 and provide it to Mr. McGuire before I took a previously scheduled personal leave of absence in mid-December 2018.

50. I do not have a specific recollection of my discussion with Ms. Auty on December 3, 2018, following my meeting with Mr. McGuire and Ms. Cameron (HAM0062483_0001). I believe I updated Ms. Auty on that meeting because Mr. Sabo was on vacation at the time, so I was reporting to Ms. Auty directly regarding the status of FOI 18-189, and because I believed that Ms. Auty was already involved in the matter, given potential liability and sensitivity concerns.

Discussions Regarding Safety of the RHVP

51. I understood that Mr. McGuire and Public Works staff were working on the safety of the RHVP as this was their responsibility and expertise. I understood from Mr. McGuire that Public Works staff were satisfied that the road was safe or that they were putting something in place to make sure it was safe in light of information contained in the Tradewind and Golder Reports. I do not have a specific recollection of the details of what measures were in place or were going to be in place to address safety. I believe that based on my practice in litigation, I likely asked Mr. McGuire if anything needed to be done to the road in the interim to ensure that the public was safe on the RHVP. I do not have a specific recollection of such a discussion or when it may have occurred, but I generally recall wanting to ensure that the road was safe, as I considered this to be something that needed to be addressed. I do not recall if I spoke to Ms. Auty or Mr. Sabo about what Mr. McGuire and Public Works were working on regarding safety.

Discussions Regarding Audit Services

52. I recall sometime prior to November 27, 2018, Mr. McGuire informed me that Audit Services was requesting documents for a value for money audit related to roads ("VFM Audit"), which would include documents related to the RHVP. I recall that Mr. McGuire was concerned because, around this time, we were in the process of responding to FOI 18-189, and we understood that RHVP-document requests had also been made by the Hamilton Spectator and a law firm.

53. At this time, I knew that Mr. McGuire and I each had a copy of the Tradewind Report, but I did not know if other City departments had a copy. I recall that we had some concern about giving another department a copy of the Golder Report, which appended

the Tradewind Report, as we did not want multiple copies of sensitive documents being distributed throughout the City when we were still working on responding to FOI 18-189 and were uncertain as to what the final response to FOI 18-189 would be. I suggested to Mr. McGuire that if he was concerned, he could take an approach I had used in the past for FOI requests involving sensitive documents, which was to make the original, unredacted copy of the document available for review in his office, but not to distribute an additional copy of it. I suggested this to Mr. McGuire because it would allow Audit Services to have access to the document, while limiting or containing the number of copies in circulation. I personally did not have much experience with Audit Services and was unfamiliar with its processes, and felt at this time that it was better to take this cautious approach. Ultimately, Mr. McGuire and/or Mr. McKinnon would decide how to respond to Audit Services. I do not believe that I spoke to Ms. Auty and/or Mr. Sabo before making this suggestion to Mr. McGuire.

54. I do not recall having any discussions with Mr. McGuire regarding the approach to Audit Services between November 27, 2018 and December 3, 2018. I did not perceive there to be any urgency in responding to Audit Services' request for documents, as I understood that the VFM Audit had been ongoing since May 2018 and did not believe that Audit Services was working to release a report imminently. I do not recall being aware that Public Works staff had provided a redacted copy of the Golder Report to Audit Services or of Audit Services' initial response until Mr. McGuire copied me onto an email chain on December 3, 2018 (HAM0061997 _0001). I do not recall preparing the redacted copy of the Golder Report provided to Audit Services (RHV0001010). Upon learning that Audit Services wanted an unredacted copy of the Golder Report, I expected to discuss

my approach and thinking with Audit Services. I did not have an opportunity to do so because I understood that Audit Services had ultimately obtained an unredacted copy of the Golder Report.

55. On December 4, 2018, Mr. McGuire called me and left a voicemail, which I asked my assistant to transcribe (HAM0064415_0001). I have attached to my affidavit the transcription of Mr. McGuire's voicemail, as **Exhibit F** (HAM0064415_0001). The same day, Mr. McGuire advised me that Mr. Pellegrini attended his office and took an unredacted copy of the Golder Report. After I became aware of this, I advised Ms. Auty and Mr. Sabo. I do not recall the specifics of any discussion(s) I had with Ms. Auty and Mr. Sabo regarding this issue. I recall being concerned because I was unfamiliar with Audit Services' processes, and thought Ms. Auty and Mr. Sabo should be aware that this had created another avenue pursuant to which the Tradewind Report could be released.

56. I later came to understand that Ms. Auty and Mr. Sabo would not have been concerned about providing an unredacted copy of the Golder Report to Audit Services and would not have made the same suggestion to Mr. McGuire.

Meeting with Mr. Zegarac, Mr. McKinnon, Mr. McGuire, Mr. McLennan and Ms. Auty

57. I recall attending a meeting with Mr. Zegarac, Mr. McKinnon, Mr. McGuire, Mr. McLennan and Ms. Auty, which may have occurred on December 6, 2018. I do not recall if I attended more than one meeting with these individuals. My role at this meeting was to update the attendees regarding the status of FOI 18-189. I recall that one purpose of the meeting was to discuss the fact that another department, Audit Services, now had a copy

of the unredacted Golder Report, appending the Tradewind Report, and if any decisions needed to be made regarding the approach to be taken or next steps in light of this.

58. I do not recall any concrete decisions being made at this meeting regarding Audit Services' acquisition of the unredacted Golder Report. I understood the purpose of the meeting was largely to share information. I was less senior than the others in attendance at this meeting. It is possible that they met and made decisions on other occasions when I was not in attendance.

59. I do not recall any discussion regarding retaining external legal counsel during that meeting.

60. I have a general recollection that there were discussions regarding whether the RHVP was safe at this meeting, and that Public Works staff indicated that they were either presently satisfied that it was, or that they were doing what needed to be done to ensure its safety. I do not have a specific recollection of those involved in this discussion, but as Mr. McGuire and Mr. McKinnon were the Public Works staff in attendance, I believe they likely provided this information.

Retaining External Legal Counsel

61. I recall Ms. Auty telling me that she wanted to retain external legal counsel some time in early December 2018, and that she was thinking of retaining David Boghosian in particular. Mr. Sabo had raised the possibility of involving Mr. Boghosian in an email I was copied on from November 21, 2018 (HAM0061984_0001). Ms. Auty and/or Mr. Sabo bore responsibility for deciding to retain external legal counsel in this matter, and I did not have any involvement in that decision. I understood that they wanted to retain external legal

counsel because there was concern about the RHVP-related litigation and the possible impact the Tradewind Report would have on the City's position, and for a second opinion on the FOI response and whether the Tradewind Report would have to be released.

62. I recall participating in a call on December 7, 2018 with Ms. Auty and Mr. Boghosian. Mr. Sabo was on vacation at this time. I attended the call from Ms. Auty's office (HAM0062495_0001). Ms. Auty and I likely had a discussion prior to the call with Mr. Boghosian during which we discussed what we intended to speak with him about. I do not have a specific recollection of the details of that discussion or the call with Mr. Boghosian. The purpose of the call was to retain Mr. Boghosian. Ms. Auty provided Mr. Boghosian with a summary of the issues for which she intended to retain him.

63. Generally, I recall that Ms. Auty advised Mr. Boghosian that there was a report dealing with friction testing that contained different information from what the City had previously understood, and that it could have an impact on litigation. Ms. Auty and Mr. Boghosian were the primary speakers on the call. I may have provided Mr. Boghosian with my preliminary views that the Tradewind Report would have to be released via FOI 18-189, but I do not recall.

64. With respect to Mr. Boghosian's note "draft letter to CIMA", I do not recall the details of any discussion about the drafting of a letter to CIMA or about who should contact CIMA regarding the Tradewind Report (HAM0064341_0001 and HAM0064359_0001). However, at some point, Ms. Auty directed me to draft a retainer letter to CIMA. I do not have a detailed recollection of when I received these instructions, or the precise instructions Ms. Auty provided. Because I do not have a specific recollection of receiving

this instruction, it is possible that she gave me this direction prior to the call with Mr. Boghosian, however it is also possible that these instructions came as a result of the discussion on the call.

Drafting Retainer Letter to CIMA

65. I understood as of December 7, 2018 that CIMA had not seen the Golder or Tradewind Reports. I do not have a specific recollection of how or when I came to have this understanding, but I expect that Mr. McGuire advised me of this.

66. Immediately following the call with Mr. Boghosian and Ms. Auty, I returned to my office and began preparing a retainer letter to CIMA ("Draft CIMA Retainer Letter"). To prepare the Draft CIMA Retainer Letter, I asked for and obtained a precedent retainer letter from someone in the Department. I do not recall who provided the precedent to me, however I do not believe that it was Ms. Auty. I have attached to my affidavit a copy of the Draft CIMA Retainer Letter as **Exhibit G** (HAM0064418_0001). As set out below, I did not finalize this Draft CIMA Retainer Letter.

67. At the same time, I also contacted Mr. McGuire to obtain the scope of CIMA's ongoing work for the City (HAM0062007_0001). I understood from my prior discussions with Mr. McGuire that CIMA was conducting ongoing work for the City, but I did not have details regarding the scope of that work, so I emailed Mr. McGuire to obtain this information. I intended to include this information in the Draft CIMA Retainer Letter, though I do not recall why. I do not recall if Mr. McGuire, or anyone else, ultimately advised me of the scope of CIMA's ongoing work. I do not recall ever discussing the RHVP with Mr. Soldo directly.

68. I prepared the Draft CIMA Retainer Letter by revising the precedent letter I obtained. I do not recall if I specifically drafted the language regarding "solicitor-client/legal advice" and "litigation privilege", or if this was language I obtained from the precedent letter.

69. I do not recall the details of any discussion with Ms. Auty and/or Mr. Boghosian about how to obtain CIMA's input on interim safety without it being subject to disclosure. However, my belief based on my recent review of the Draft CIMA Retainer Letter and certain emails between Ms. Auty and Mr. Boghosian (HAM0062502_0001, HAM0064323_0001), is that the purpose of the Department retaining CIMA, rather than Public Works, would have been to protect the channel of communication between CIMA and the City from disclosure using legal privilege.

70. I do not recall if I specifically drafted the language used in the paragraphs relating to the "terms and conditions with regards to the City's disclosure to [CIMA] of the Tradewind Report". It is my belief that I likely was revising language that was found in the precedent letter, as I was trying to ensure my drafting was consistent with what was used in past retainer letters.

71. I do not recall turning my mind to whether the terms and conditions in the Draft CIMA Retainer Letter would have the effect of limiting CIMA's ability to speak to Public Works staff about the Tradewind Report.

72. I do not recall any discussions with Ms. Auty, Mr. Sabo or Mr. Boghosian about whether Public Works should be communicating directly with CIMA regarding the Tradewind Report, or the appropriate flow of information between CIMA, the Department

and Public Works. I was not responsible for determining which department, if any, at the City ultimately retained CIMA. In my view, if Public Works staff felt that there was information in the Tradewind Report that they needed to share with CIMA, they would have explained that to the Department, and it would have been discussed.

73. I drafted the paragraphs on CIMA's proposed mandate based on my understanding of what was discussed during the call with Ms. Auty and Mr. Boghosian, as well as Ms. Auty's instructions, however I do not have a specific recollection of these discussions. I do not recall the reason(s) why this particular mandate was sought:

> 1. [CIMA's] expert findings, opinions and conclusions on whether there are any remediation measures that should be taken by the City to address any safety concerns that may exist with the Red Hill Valley Parkway ("the RHVP") between now and the Summer of 2019 when the RHVP will be resurfaced.
>
> 2. [CIMA's] concerning whether or not possible further inquiries, investigations and testing are advisable.

74. I recall that I never finalized the Draft CIMA Retainer Letter because I was not confident that I fully understood exactly what Ms. Auty was trying to capture or address in the letter. I felt that it would be best for Ms. Auty or Mr. Boghosian to prepare the letter. I advised Ms. Auty of this, though I do not have a specific recollection of this discussion or when it occured. I do not recall if I sent or otherwise showed Ms. Auty a copy of the Draft CIMA Retainer Letter.

75. I do not recall any discussions with Ms. Auty about asking for Mr. Boghosian's advice on how to approach or contact CIMA regarding the Tradewind Report, although I may had such a discussion. I understood that Ms. Auty was seeking this advice from Mr.

Boghosian when I reviewed Ms. Auty's draft retainer letter addressed to Mr. Boghosian, which she provided to me on December 7, 2018 for review and comment (HAM0062496_0001 and HAM0062497_0001). I do not recall if I had already spoken to Ms. Auty about the Draft CIMA Retainer Letter by the time she sent me Mr. Boghosian's draft retainer letter. I also do not recall if my discussion with Ms. Auty about the Draft CIMA Retainer letter preceded her email to Mr. Boghosian on December 7, 2018 at 3:18pm in which she asked him for advice on "[h]ow to approach obtaining CIMA consultant input on whether interim measures are needed to protect safety before the resurfacing is completed in June 2019 (litigation privilege?)." (HAM0062502_0001)

76. Ms. Auty was responsible for deciding the scope of Mr. Boghosian's retainer and ultimately prepared the first draft of the retainer of his law firm. My primary role in retaining external legal counsel was to assist Ms. Auty in answering questions and providing her information on key documents as it related to FOI 18-189.

77. Once I explained to Ms. Auty that I felt it was preferable for someone else to complete the Draft CIMA Retainer Letter, I no longer had any involvement in the discussions or decisions regarding retaining CIMA. I was not asked to continue to work on the Draft CIMA Retainer Letter. To my knowledge, no one in the Department ultimately finalized or sent a retainer letter to CIMA. I have no knowledge of what action, if any, Mr. Boghosian took to contact or retain CIMA, other than what I have learned through my involvement in this Inquiry.

Advice Regarding Contact with CIMA

78. I do not recall if I had any discussions with Mr. McGuire about his desire to contact CIMA confidentially, apart from his emails on December 8 and 12, 2018 (HAM0053949_0001 and HAM0062510_0001). I did not have a specific understanding of why Mr. McGuire wanted to contact CIMA confidentially. My assumption at the time was that it was to find out what CIMA knew or did not know regarding the Tradewind Report, and to try to better understand what had happened in 2014-2015.

79. I do not specifically recall why Mr. McGuire had the impression that someone in the Department would be contacting Brian Malone. I do not have any recollection of discussing with Mr. McGuire, or anyone in the Public Works Department, that the Department was considering retaining CIMA to, among other things, assess interim safety measures, apart from my emails to Mr. McGuire referenced above. I did not send or otherwise show Mr. McGuire a copy of the Draft CIMA Retainer Letter. It appears from the documents I have reviewed that Mr. McGuire thought I was going to contact CIMA, however, this was not part of my role, which was limited to FOI 18-189. It is my belief that I must have said something to Mr. McGuire to give him that impression, however I do not have any recollection of this.

80. I do not know if, as of that time, Mr. McGuire was aware that the City was retaining external legal counsel in connection with the RHVP matter. I was not in a position to tell Mr. McGuire who the City was retaining, as I did not yet know if Mr. Boghosian had been retained, and I was not sure of the scope of his retainer or who was going to be responsible for what. At this time, I understood that Ms. Auty, and perhaps Mr. Boghosian, were addressing the question of how to contact CIMA.

81. I do not believe I told Ms. Auty, Mr. Sabo or Mr. Boghosian that Mr. McGuire wanted to contact CIMA confidentially.

82. I "strongly advised" Mr. McGuire not to contact CIMA on December 10, 2018 (HAM0053949_0001) because I knew that Ms. Auty was in the midst of retaining Mr. Boghosian and I did not know what advice Mr. Boghosian could provide about contacting CIMA or what information to give CIMA. I wanted to put the discussion with CIMA "on pause" momentarily until decisions could be made by others, so that something was not inadvertently influenced by a quick decision.

83. My understanding that Ms. Auty and Mr. Boghosian were addressing who was to be responsible for contacting or retaining CIMA was confirmed when, on December 11, 2018, Ms. Auty forwarded me an email exchange she had with Mr. Boghosian, in which they discussed "how to obtain an opinion from CIMA regarding interim safety measures regarding the condition of the RHVE pending re-surfacing in June 2019" in a way that "could prevent access to any correspondence they send conferring their opinion" (HAM0062502_0001, HAM0064323_0001).

84. As City Solicitor, Ms. Auty was the ultimate decision maker on the direction that the Department would be taking. In writing, "I haven't received any direction on this yet" in my email to Mr. McGuire on December 12, 2018 (HAM0062510_0001), on which Ms. Auty was copied, the direction I was referring to was that I was waiting for confirmation from Ms. Auty that external counsel had been retained and confirmation about who would be the appropriate person to be the conduit for any discussions with CIMA. When writing "We should be able to update you this week (I hope by mid-week)" in my email to Mr.

McGuire on December 10, 2018 (HAM0053949_0001), I do not recall if I expected Ms. Auty to update Mr. McGuire directly regarding whether he could contact CIMA. I did not expect Ms. Auty to provide me with such an update, though I do not recall if she ultimately did so. While I do not believe I advised Ms. Auty, Mr. Sabo or Mr. Boghosian that Mr. McGuire had wanted to contact CIMA confidentially, I expected that Mr. McGuire would be updated by someone regarding CIMA.

85. In giving advice to Mr. McGuire not to contact CIMA, I had intended Mr. McGuire to hold off giving CIMA a copy of the Tradewind or Golder Reports and having discussions with them about CIMA's views and/or response until further direction had been received from external counsel and/or Ms. Auty.

86. I did not intend that Mr. McGuire should not discuss the safety of the RHVP with CIMA nor did I view my advice as impacting what decisions were being made regarding safety or restricting or limiting Public Works' ability to communicate with CIMA regarding the work it was presently conducting on the RHVP, or the RHVP's safety more generally. I would not have given Mr. McGuire advice on anything to do with safety of the RHVP, and I do not believe that Mr. McGuire would have sought such advice from me. I understood that safety measures, interim or otherwise, were the responsibility, obligation and role of Public Works, and that they were doing what they believed needed to be done to address RHVP safety. I was not aware of the precise scope of the work CIMA was doing in 2018. In contrast, Public Works staff were aware of CIMA's mandate for the work it was already conducting at this time, and if they felt CIMA required the Tradewind Report, I expected that they would have advised the Department of this and, to my knowledge,

they did not. I understood this to mean that CIMA did not require the Tradewind or Golder Reports for its then current work with the City, and that it was not needed to make decisions on safety measures that needed to be implemented, as I understood Public Works to already be addressing RHVP safety. I understood the Tradewind Report to be dated, and that other reports and work had been completed on the RHVP since it was prepared.

87. I do not recall if I had any discussions with Ms. Auty and/or Mr. Sabo about Mr. McGuire's December 12, 2018 email following up about contacting Mr. Malone (HAM0062510_0001). Based on the language of my responding email to Mr. McGuire, I likely followed up with Ms. Auty and/or Mr. Sabo, but I do not have a recollection of doing so. I also understood that Mr. Boghosian was already alert to CIMA being a potentially important party to talk to. It is my belief, based on the language of my email, that I was not aware of who was responsible for retaining or contacting CIMA as of December 12, 2018, though I acknowledge that I was copied onto an email chain on December 11, 2018, which included an email from Ms. Auty in which she instructed Mr. Boghosian to contact CIMA (HAM0064323_0001).

88. At some point, I was told that Mr. Boghosian was retained as external legal counsel, but do not recall who told me this or when I was told that. I acknowledge that the email chain I was copied onto on December 11, 2018 also included confirmation of Mr. Boghosian's retainer (HAM0064323_0001). I do not recall if I advised Mr. McGuire that external legal counsel, Mr. Boghosian, had been retained, or if I had subsequent discussions with Mr. McGuire regarding contact with CIMA. I do not recall being provided

with information regarding who was ultimately to be responsible for contacting and/or retaining CIMA, though I acknowledge that I was copied onto an email chain on December 11, 2018, which included an email from Ms. Auty in which she instructed Mr. Boghosian to contact CIMA (HAM0064323_0001). I did not expect to receive such an update, as I was focused on my task of responding to FOI 18-189. I do not know if anyone ever provided such an update to Mr. McGuire.

89. I did not receive a copy of Mr. Boghosian's draft or final opinion letter. After the call on December 7, 2018, I do not recall having any further involvement with Mr. Boghosian.

90. I took a personal leave of absence from the City starting in mid-December 2018. I was aware of this upcoming leave before it started.

91. On December 16, 2018, prior to departing on my leave, I emailed Mr. McGuire a chart outlining my thoughts on the responsiveness of the documents I received from his office, as well as the potential applicability of any exemptions to disclosure under *MFIPPA* (HAM0062020_0001 and HAM0062021_0001). In the chart, I identified an exemption under s. 7 of *MFIPPA* that could possibly apply to both the Tradewind Report and the Golder Report. Despite my inclusion of a possible exemption in this chart, I maintained my view that the Tradewind Report was likely to be released pursuant to FOI 18-189. I did not think that the s. 7 exemption would, or should, be successful in preventing the release of the two reports, however I viewed my role as the solicitor providing advice to a client department to be to identify any potential exemptions that could apply. Because the Golder and Tradewind Reports were advice from an external consultant, I felt that there was a potential argument that the reports, and in particular the text I highlighted in the

hard copy I provided to Mr. McGuire (which I referred to as the "working copy" in the chart I provided), fell within the s. 7 exemption (HAM0062020_0001, HAM0062021_0001, HAM0061519_0001 and HAM0064428_0001). I have attached to my affidavit a copy of a memorandum Ms. Delry sent to Mr. McGuire which enclosed the highlighted hard copy documents corresponding to the chart I sent by email as **Exhibit H** (HAM0064428_0001).

92. After December 17, 2018, I believe Mr. Sabo was responsible for assisting Public Works with FOI 18-189 after my departure on leave. I do not recall if Mr. Sabo or anyone else from Legal Services had any continued involvement with FOI 18-189 from April 2019 onward.

93. I returned from my leave on April 1, 2019, and do not recall having any further involvement upon my return, apart from receiving an update from Mr. Sabo advising that the materials for FOI 18-189 appear to have been released to the requestor (HAM0062627_0001). To the best of my recollection, I did not have any involvement in FOI 18-189 or any RHVP-related issues by providing legal services to a client department after returning from my leave.

94. I have no recollection of why any documents after April 1, 2019 related to FOI 18-189 or the RHVP more generally were included in my file but I acknowledge that I appear to have reviewed documents over time which were placed in my file. To the best of my memory, these documents do not indicate any ongoing involvement in matters relating to the RHVP after my return from my leave of absence; they were just documents relating to the FOI 18-189/RHVP file and so they were placed in the file folder. As noted above, I

do not recall being further involved in providing legal services to a client department in matters relating to the RHVP after my return to the City in April 2019.

95. In preparing this affidavit, I have been informed that recent City productions list me as the custodian for certain documents that were released to the requestor as of November 4, 2019. I have no memory of how I came to be in possession of documents related to subsequent releases of documents responsive to FOI 18-189.

96. I make this affidavit for use in the Red Hill Valley Parkway Inquiry.

Affirmed remotely by Byrdena MacNeil of the City of Hamilton before me in the City of Toronto in the Province of Ontario, this 15th day of March, 2023, in accordance with O. Reg. 431/20, Administering Oath or Declaration Remotely

Olivia Eng	B. MacNeil
A Commissioner for Taking Affidavits	Byrdena MacNeil
Olivia Eng, LSO 84895P	

This is **Exhibit "A"** referred to in
the Affidavit of **Byrdena MacNeil**
sworn this 15th day of March, 2023

Olivia Eng

A Commissioner for Taking Affidavits

Details for Matter: 18-1054 - FOI #18-189 – MFIPPA Access Request for Red Hill Valley Parkway (RHVP) Friction Testing and Asphalt and/or Pavement Testing Records

MatterId	:	18-1054
Matter/Case Name	:	FOI #18-189 – MFIPPA Access Request for Red Hill Valley Parkway (RHVP) Friction Testing and Asphalt and/or Pavement Testing Records
Status	:	Open
Third Party	:	
Fourth Party	:	
File Class	:	General
File Type	:	
Solicitor	:	MacNeil, Byrdena
Law Clerk	:	Bentley, Carla
Assistant	:	Delry, Pam
Date File Opened	:	11/20/2018
Chargeback Client	:	PW - Energy, Fleet & Facilities
Client Dept	:	PW - Energy, Fleet & Facilities
Chargeback	:	No
Capital Project ID#	:	
Contact Person	:	Gord McGuire
Description	:	FOI #18-189 – MFIPPA Access Request for Red Hill Valley Parkway (RHVP) Friction Testing and Asphalt and/or Pavement Testing Records
	:	
Notes/Status	:	file received Nov 8, 2018; assigned Nov 9, 2018
Date of Loss	:	
Location of Loss	:	
SOC Date Filed	:	
RMS Claim No.	:	
RMS Rep	:	
RMS Rep Other	:	
Amount Claimed	:	
Amount Paid/Received	:	
Outside Counsel	:	
Date Sent	:	
Date Returned	:	
Date Closed	:	
Disposition	:	
Disposal Date	:	
File Location	:	
Created By	:	pdelry
Modified By	:	pdelry

This is **Exhibit "B"** referred to in
the Affidavit of **Byrdena MacNeil**
sworn this 15th day of March, 2023

Olivia Eng

A Commissioner for Taking Affidavits

File #18-189

Request for Access to Municipal Records Information Sheet

Access and Privacy Officer: Anne Watson
Telephone: (905) 546-2424 ext. 4632
Fax: (905) 546-2095
E-mail: anne.watson@hamilton.ca

The City is in receipt of a request to access municipal records pursuant to the provisions of the *Municipal Freedom of Information and Protection of Privacy Act* (the *Act*).

Please review the request details below and complete the necessary searches for responsive records. Your department has seven (7) calendar days in which to complete its record searches and provide a response to our office.

If it appears that the **record searches** will exceed three (3) hours, you may wish to consider conducting a representative search of a smaller amount of records; providing our Office with a search time estimate detailed on page 2 of the Information Sheet. Based on your department's response our office will determine whether or not to issue a fee estimate to the requester before proceeding further with the request.

Your department response, including the completed Information Sheet and a **HARD COPY** of the responsive records, SINGLE- SIDED AND UN-STAPLED is due at our Office (**CITY HALL, 1ST FLR**) by **Thursday, November 15, 2018.**

Please contact **Anne Watson** if you have questions concerning the request or require assistance to complete page 2 of this form.

Access to any reports, memos, drafts, correspondence about **friction testing** on the Red Hill Valley Parkway in the **last five years** AND any reports, memos (including drafts), or correspondence about **asphalt and/or pavement testing, assessments, plans** on the Red Hill Valley Parkway in the last **two years**

HAM0061852_0001

Name: Gord McGuire____________ Division/Section: Engineering Services

Phone: _2439

1. **Does your Department/division/section have records responsive to this request?** A record is defined as any record of information however recorded, whether in printed form, on film, by electronic means or otherwise. (e.g. reports, correspondence, memos, Inspector notebooks, books, plans, maps, drawings, diagrams, pictorial or graphic works, photographs, film, microfilm, sound recordings, e-mails)

   X Yes No

2. Are any of the records that are responsive to this request, available to the Public directly through your Department? If yes, please **identify the record(s)**, any **applicable department fees**, and a **contact person and telephone number** (DO NOT PROVIDE a copy of the records if the records are available directly through your office).

    Yes X No

3. If your Department has records responsive to the request that are **not** routinely available through your Department, please provide information describing the following:

   - The type of records;
   - Physical location of records and how the records are stored or maintained;
   - Approximate volume of responsive records;
   - The activities involved in identifying the responsive records
   - **List any concerns about disclosure of the records(s)**

Key staff will be out of the office from November 15th to November 26th and will not be available for the next 2 weeks.

We have records for both the 2 year and 5 year requests, however, some of those records may be exempt from disclosure under MFIPPA. As a result, we require an extension of 5 -6 weeks to allow us reasonable time to assemble, collect and review all the records, and to consult with Legal Services and other parties outside the institution, as necessary, about any possible MFIPPA exemptions.

This request necessitates a search through a large number of records.

4. Under the *Act* the City can apply fees for **record searching, record preparation, and photocopying ONLY**. However, for internal purposes the FOI Office does track the amount of time spent by City staff on each FOI request. Please indicate the amount of time spent completing **EACH** of the following activities (**if applicable**):

   - Searching for responsive records ___2-3_days______
   - Searching & Printing microfiche records __________
   - Searching & Printing AMANDA/HANSEN records __________
   - Pulling records __________
   - Reviewing records _2-3 days_________
   - Copying records ___0.5 day_______
   - Assembling/scanning/delivering/faxing records _____0.5 day_____

5. Are you aware of any other **City Department** (**e.g**. Public Works, Corporate Services, Healthy & Safe Communities) that may have responsive record(s)? If yes, please identify the Department and provide staff contact information if known.

    Yes X No ____

   (If you are aware of **another** division or section **within** your **City Department** that may have responsive records, please ensure that the request details are appropriately disseminated and the response(s) included in your **Department's complete response**.)

[DATE \@ "M/d/yyyy"]

[DATE \@ "M/d/yyyy"]

This is **Exhibit "C"** referred to in
the Affidavit of **Byrdena MacNeil**
sworn this 15th day of March, 2023

Olivia Eng

A Commissioner for Taking Affidavits

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	July 19, 2019 4:12 PM
To:	RHVP Inquiry Legal Hold
Subject:	Legal Hold Notice - B. MacNeil
Attachments:	Legal Hold Notice - Byrdena MacNeil - July 19-19.pdf

Attached, please find my signed copy of the Legal Hold Notice, as requested.

Thanks,

Hamilton

Mailing Address:
City of Hamilton - Legal Services
City Hall
71 Main Street West
Hamilton, Ontario L8P 4Y5

Byrdena M. MacNeil, Solicitor

Legal Services, City of Hamilton
Phone: 905.546.2424, ext. 4637
Fax: 905.546.4370
Courier: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9

Privileged & Confidential

LEGAL HOLD NOTICE

A Judicial Inquiry, a proposed Class Action and other litigation have been commenced that relate, at least in part, to the Red Hill Valley Parkway (the "**Proceedings**"). You are receiving this Legal Hold Notice because you have been identified as someone who may possess or control documents that are relevant to the Proceedings.

Beginning immediately, and for the indefinite future, you must not destroy, delete, alter or dispose of any documents in your possession or control that relate to the matters at issue in the Proceedings.

1. What are the Issues in the Proceedings?

A variety of issues may be addressed in the Proceedings. The issues that will be explored in the Judicial Inquiry are set out in the Terms of Reference attached to this document, and the issues that may be addressed in the proposed Class Action are set out in the Statement of Claim attached to this document. Please read the Terms of Reference and Statement of Claim carefully. For greater clarity, documents related to any of the following issues must be preserved:

- Design, engineering, construction and maintenance of the Red Hill Valley Parkway, including selection of road surfacing materials and geometric design;
- Testing conducted of the Red Hill Valley Parkway and the LINC;
- Friction, asphalt or general road safety of the Red Hill Valley Parkway and the LINC;
- Reports or assessments with respect to the Red Hill Valley Parkway, including reports from the Ministry of Transportation;

  Action taken by the City of Hamilton in respect of reports or assessments with respect to the Red Hill Valley Parkway
- Policies and procedures of the City of Hamilton's Public Works Department, including the Engineering Services and Transportation Operations & Maintenance divisions, regarding reviewing and reporting on information or reports submitted to or requested by the Department.
- Acceptable friction levels on a roadway.
- Causes of motor vehicle accidents on the Red Hill Valley Parkway.
- Red Hill Valley Parkway accident rates and reports.

- Communications between the City of Hamilton and any of Golder Associates, Tradewind Scientific, and/or Dufferin Construction.

- The relationship between the City of Hamilton and any of Golder Associates, Tradewind Scientific, and/or Dufferin Construction, including but not limited to: sponsorships, donations, entertainment, promotional materials, lobbying, and co-authorship or collaboration by employees or representatives thereof respecting any publication, article, presentation, or report.

- Documents with respect to all of the above.

2. How Do I Preserve Documents?

"Document" is defined broadly under this Legal Hold. It includes any type of draft or final hard copy handwritten or printed material or electronically stored information, data or communications such as email contained in business or personal email accounts, text messages or instant messages (e.g. WhatsApp), presentations, spreadsheets, photographs, voicemail messages, audio or video recordings stored on business or personal desktops, laptops, mobile devices or external drives. On a going forward basis:

- Documents need to be preserved regardless of where or how they are stored including, but not limited to, on your work or personal computer or laptop, on the City's server, on your work or personal smart phone or tablet, or in your City or personal email accounts.

- Documents you preserve should be maintained in their original format and in their current location.

- Various versions of a document are considered unique documents and must be preserved if they relate to the issues in the Inquiry.

- You should preserve a document even if you think someone else has a copy of it.

- Please ensure that any automatic or ordinary course purging or deletion of documentation which may be related to the Proceedings is stopped. For example, if you are scheduled to receive a new computer or smart phone, switch jobs or leave your employment with the City permanently please contact Nicole Auty to ensure that all documents which require preservation under this notice are properly maintained through this process.

3. What Else Do I need to Know About this Legal Hold?

This Legal Hold Notice is for internal distribution only and is a communication covered by solicitor-client privilege. Accordingly, you must take every effort to maintain the confidentiality of this Legal Hold Notice and any related communications.

You do not need to take steps to collect copies of any potentially relevant documents at this time. This Legal Hold Notice simply requires you to ensure any such documents are not destroyed, deleted, altered or disposed of. Legal counsel will be in touch with you in future to coordinate the collection of documents in respect of the Judicial Inquiry, the proposed Class Action and/or other litigation. Compliance with this Legal Hold is mandatory. Consequences of non-compliance can be severe, including the presumptions of wrongdoing, reputational damage, and possible civil or criminal liability. Any doubts as to whether documents should be kept should be resolved in favour of preservation.

This Legal Hold remains in effect until such time as you are informed otherwise.

If you have any questions about this Legal Hold, including the nature of documents that require preservation and the technical requirements set out here please contact Nicole Auty at Nicole.Auty@hamilton.ca

The undersigned hereby acknowledges receipt of this Legal Hold as well as an understanding of the requirements within. The undersigned intends to abide by this Legal Hold.

A signed copy of this legal notice must be sent to rhvplegalhold@hamilton.ca **by July 31, 2019**

BYRDENA M. MACNEIL — Byrdena M. MacNeil — July 19, 2019

Name: **Signature:** **Date:**

TOR_LAW\ 9956746\2

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 16, 2018 9:38 PM
To:	McGuire, Gord
Cc:	Auty, Nicole; Sabo, Ron; McLennan, John; Bentley, Carla; Delry, Pam
Subject:	RE: CIMA Report 2013 and FOI 18-189 - RHVP
Attachments:	FINAL Responsive Records Chart.doc
Importance:	High
Sensitivity:	Confidential

SOLICITOR-CLIENT PRIVILEGED

Hi Gord,

Further to my earlier email of this evening, I write with respect to the following matters:

Committee and Council Reports

Thanks for sending along the reports PW18-008 and PW15091. Would these be the only Committee or Council reports dealing with (i) friction of RHVP (2013-2018) and (ii) asphalt and/or pavement of RHVP (2016-2018)?

If not, your office should collect all of the relevant Committee and Council reports in order to deliver them to Anne Watson as part of your response to FOI 18-189. If they are public reports, then there are no MFIPPA exemptions to be claimed and they would be disclosed.

If, however, any of the reports are confidential or in camera, then s. 6 of MFIPPA should be claimed for them. Section 6 reads:

Draft by-laws, etc.

6 (1) A head may refuse to disclose a record,

(a) that contains a draft of a by-law or a draft of a private bill; or

(b) that reveals the substance of deliberations of a meeting of a council, board, commission or other body or a committee of one of them if a statute authorizes holding that meeting in the absence of the public.

Exception

(2) Despite subsection (1), a head shall not refuse under subsection (1) to disclose a record if,

(a) in the case of a record under clause (1) (a), the draft has been considered in a meeting open to the public;

(b) in the case of a record under clause (1) (b), the subject-matter of the deliberations has been considered in a meeting open to the public; or

(c) the record is more than twenty years old. R.S.O. 1990, c. M.56, s. 6.

Review of Responsiveness of Documents You Have Already Provided

I attach a chart setting out my thoughts on which exemptions may apply to the documents which you have provided us to date with respect to FOI 18-189. My office will send you a hard copy of the documents corresponding to the Index that have been highlighted, so that you will be able to review and consider same. If you agree with the suggested exemptions, then your office should send a copy of the documents (as highlighted), along with the Index, to Anne Watson for her review and consideration.

There may very well be additional exemptions that Anne identifies and applies so as to exempt some of the records so she should be asked to advise you if there are any additional MFIPPA exemptions that apply.

I note that Mike Becke's office is still working on locating/obtaining relevant documents that will need to also be forwarded to Anne Watson. Obviously I have not reviewed same.

Contact will be Ron Sabo

Finally, unfortunately, I am going to be away from work after tonight for some time due to a personal situation. In my absence, please be sure to contact Ron Sabo on a going forward basis. (And I am sorry to leave you in the lurch.)

Thanks,
Byrdena

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-16-18 8:50 PM
To: MacNeil, Byrdena; Auty, Nicole; Sabo, Ron; McLennan, John
Subject: RE: CIMA Report 2013 and FOI 18-189 - RHVP
Sensitivity: Confidential

Thanks Byrdena:

I've attached 2 reports on the Linc / RHVP.

In 2015 we identify a series of issues and countermeasures. In 2018 there is a comprehensive report that has a detailed discussion on most element along this facility.

Appendix A notes that Friction Testing as a medium term measure has been performed, and is marked complete.

These reports are responsive to the internal audit questions, and may be as well to the MFIPPA process.

We can discuss this next week if you're available.
Thanks

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: MacNeil, Byrdena
Sent: December 16, 2018 7:31 PM
To: McGuire, Gord <Gord.McGuire@hamilton.ca>; Auty, Nicole <Nicole.Auty@hamilton.ca>; Sabo, Ron <Ron.Sabo@hamilton.ca>; McLennan, John <John.McLennan@hamilton.ca>
Subject: CIMA Report 2013 and FOI 18-189 - RHVP
Sensitivity: Confidential

SOLICITOR-CLIENT PRIVILEGED

Attached, for your information and file, please find a copy of the "Red Hill Valley Parkway Safety Review" prepared by CIMA in October 2013 (am sending in 4 parts).

This has been produced to plaintiff's counsel as part of the City's AOD in the *Hansen* litigation being handled by Dana Lezau (Court File No.: 17-61728). Note that the report recommends that the City should perform friction testing.

Gord, it appears to me that this record is responsive to the FOI 18-189 access request, in the same way that the 2015 CIMA report is responsive. The 2013 report is also mentioned in the 2015 report at page 2 (para. 1) wherein it states:

"…In 2013, CIMA Canada Inc. (CIMA) conducted a safety review of the section of the RHVP between the Dartnall Road and Greenhill Avenue interchanges, providing a series of recommendations to improve safety."

I would recommend that this 2013 CIMA report be included in the volume of documents that are provided to Anne Watson in response to FOI 18-189.

Thanks,
Byrdena

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

FOI #18-189

INDEX IDENTIFYING POSSIBLE MFIPPA EXEMPTIONS

Tab	Date	Description	Responsiveness to Request #1 re Friction Testing (2013-2018)	Responsiveness to Request #2 re Asphalt/Pavement Testing (2016-2018)
1	Oct 18, 2007	Email from Ludomir Uzarowski to Gary Moore, Marco Oddi re Friction on SMA on Hamilton's Red Hill Valley Parkway	Not responsive, because a 2007 document	Not responsive, because a 2007 document
2	Oct 4, 2013	Email from Stephen Cooper to Michael Becke, Alan J. Jazvac re RHVP – re-surface date	Not responsive	Yes but outside the relevant time-frame
3	Nov 20, 2013	Friction Testing Survey Summary Report prepared by Tradewind Scientific for Golder Associates Ltd.	Yes; possible s. 7 Advice and Recommendations exemption, see especially orange highlighting in working copy	Not responsive
4	Jan 2014	Performance Review after Six Years in Service re Redhill Valley Parkway prepared by Golder Associates	Not entirely responsive but portions are, including Tradewind Report; same exemptions applying to Tradewind Report identified in Tab 3 record would apply here	Not responsive
5	Jan 24, 2014	Email from Gary Moore to Thomas Dziedziejko re Red Hill SMA	Yes; no exemptions	Not responsive
6	Nov 2015	Red Hill Valley Parkway Detailed Safety Analysis prepared by CIMA	Yes; portions are responsive. However, since this report is already in the public domain (it is available on the City of Hamilton website) it should be released in its entirety	Not responsive
7	Dec 17, 2015	Email from Ludomir Uzarowski to Gary Moore re Red Hill SMA	Same exemptions applying to Tradewind Report identified in Tab 3 record would apply here	Not responsive

Tab	Date	Description	Responsiveness to Request #1 re Friction Testing (2013-2018)	Responsiveness to Request #2 re Asphalt/Pavement Testing (2016-2018)
8	Apr 18, 2016	Email from Richard Andoga to Michael Becke, Alan J. Jazvac re LINC – Red Hill Rehabilitation	Not responsive	Yes; no exemptions identified
9	Apr 7, 2017	Email from Richard Andoga to Lisa Castronovo re LINC – Redhill resurfacing – project scope	Not responsive	Yes; no exemptions identified
10	Apr 27, 2017	Email from Ludomir Uzarowski to Richard Andoga re Red Hill Valley Parkway Dip/Bump Analysis	Not responsive	Yes; no exemptions identified
11	Jun 12, 2017	Email from Sarath Vala to Susan Jacob re CPMS 10986 – Redhill Valley Parkway (RHVP) Rehabilitation	Not responsive	Yes; no exemptions identified
12	Jun 19, 2017	Email from Richard Andoga to David Ferguson re CPMS 10986 – Redhill Valley Parkway (RHVP) Rehabilitation	Not responsive	Yes; no exemptions identified
13	Jun 20, 2017	Email from Richard Andoga to David Ferguson re CPMS 10986 – Redhill Valley Parkway (RHVP) Rehabilitation	Not responsive	Yes; no exemptions identified
14	Jun 20, 2017	Email from Richard Andoga to David Ferguson re CPMS 10986 - Redhill Valley Parkway (RHVP) Rehabilitation	REPEAT of TAB 13	
15	Jul 27, 2017	Email from Susan Jacob to Sarath Vala, Michael Becke re RHVP Scope	Not responsive	Yes; no exemptions identified
16	Aug 18, 2017	Email from Sarath Vala to Michael Becke re RHVP Scope	Not responsive	Yes; possible s. 7 Advice & Recommendations exemption
17	Aug 18, 2017	Email from Gary Moore to Michael Becke, Richard Andoga re RHVP reinstatement of monitoring loops	Not responsive	Yes; no exemptions identified

Tab	Date	Description	Responsiveness to Request #1 re Friction Testing (2013-2018)	Responsiveness to Request #2 re Asphalt/Pavement Testing (2016-2018)
18	Aug 28, 2017	Email from Richard Andoga to Michael Becke re LINC – RHVP resurfacing	Not responsive	Yes; no exemptions identified
19	Sep 22, 2017	Email from Bob Butrym to Sarath Vala re Red Hill Valley Parkway (RHVP) – MTO Coordination 7 Maintenance of Traffic	Not responsive	Yes; no exemptions identified
20	Oct 3, 2017	Email from Michael Becke to Christopher Norris re RHVP – NB Core Location-A	Not responsive	Yes; no exemptions identified
21	Oct 3, 2017	Email from Bob Butrym to Sarath Vala re RHVP Resurfacing Project – MTO (Central Region) Temp Conditions Traffic Management: Advance Signing (Notification, Warning, Alt Route)	Not responsive	Yes; no exemptions identified
22	Oct 13, 2017	Email from Richard Andoga to Sarath Vala, Alan J. Jazvac, Harry Krinas re Redhill Valley Parkway (CPMS 10986) – Rehabilitation Project	Not responsive	Yes; no exemptions identified
23	Nov 23, 2017	Letter from Golder Associates to Gary Moore re Evaluation of Pavement Surface Skid Resistance Red Hill Valley Parkway, City of Hamilton	Yes; possible s. 10 3rd Party Information exemption	Not responsive
24	Nov 24, 2017	Email from Gary Moore to Ludomir Uzarowski re Red Hill – testing for possible Hot in place	Not responsive	Yes; no exemptions identified
25	Nov 24, 2017	Email from Gary Moore to Michael Becke, Richard Andoga re Red Hill – testing for possible Hot in Place	Yes; possible s. 10 3rd Party Information exemption	Yes; possible s. 7 Advice & Recommendations exemption; and possible s. 10 3rd Party Information exemption
26	Jan 2, 2018	Email from Nicholas Zanello to Rodney Aitchison, Stephen Cooper, David Ferguson re RHVP – North bound resurfacing – Traffic Drawings C15-34-18 (H)	Not responsive	Yes; no exemptions identified

Tab	Date	Description	Responsiveness to Request #1 re Friction Testing (2013-2018)	Responsiveness to Request #2 re Asphalt/Pavement Testing (2016-2018)
27	Jan 31, 2018	Email from Michael Becke to Richard Andoga, Gary Moore, Dennis Perusin, Susan Jacob re MTO Contract for Hot in Place Recycling (Tender & Contract Drawings attached)	Not responsive	Yes. The enclosure is a document belonging to the Province but the accompanying email notes that the document is publically available
28	Feb 28, 2018	Email from Ludomir Uzarowski to Michael Becke re Meeting to discuss rehab strategy for RHVP – 2019	Not responsive	Yes; no exemptions identified
29	Mar 2, 2018	Email from Gary Moore to Michael Becke re Reflectors in Red Hill	Not responsive	Yes; no exemptions identified
30	Mar 8, 2018	Email from Michael Becke to Gary Moore re RHVP Strategies - Email from Ludomir regarding HIP	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption applies
31	Mar 13, 2018	Email from Ludomir Uzarowski to Michael Becke re foamed asphalt and RHVP HIR	Not responsive	Yes; no exemptions identified
32	Mar 13, 2018	Email from Gary Moore to Michael Becke re Hot in-place recycling of SMA	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption applies
33	Apr 9, 2018	Email from Michael Becke to Gord McGuire re Hot in place recycling	Not responsive	Yes; no exemptions identified
34	Jun 6, 2018	Email from Ludomir Uzarowski to Michael Becke re HIR of RHVP pavement	Not responsive	Yes; possible s. 10 3rd Party Information exemption
35	Jun 14, 2018	Email from Ludomir Uzarowski to Michael Becke re HIR of RHVP pavement	Not responsive	Yes; possible s. 7 Advice & Recommendations exemption; and possible s. 10 3rd Party Information exemption
36	Jun 14, 2018	Email from Ludomir Uzarowski to Michael Becke re HIR on RHVP	Not responsive	Yes; possible s. 10 3rd Party Information exemption

Tab	Date	Description	Responsiveness to Request #1 re Friction Testing (2013-2018)	Responsiveness to Request #2 re Asphalt/Pavement Testing (2016-2018)
37	Jun 27, 2018	Email from Gary Moore to Richard Andoga, Michael Becke, Susan Jacob, Marco Oddi re Hot in place asphalt	Not responsive	Yes; no exemptions identified
38	Jun 27, 2018	Email from Michael Becke to Sam Sidawi, Gord McGuire, Richard Andoga re Hot in place – next steps	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption applies
39	Jul 16, 2018	Email from Michael Becke to Ludomir Uzarowski re Redhill Samples	Not responsive	Yes; no exemptions identified
40	Jul 17, 2018	Email from Robert Marques to Bob Butrym re FTMS Sign Message Request for Toronto-bound QEW in advance of Red Hill Valley Parkway	Not responsive	Yes; no exemptions identified
41	Jul 17, 2018	Email from Michael Becke to Gord McGuire re Red Hill Valley Parkway – Investigation works	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption applies
42	Jul 17, 2018	Email from Michael Becke to Chris Olszewski, Bob Butrym, Robert Marques, Martin White, Susan Jacob, Gord McGuire, Jasmine Graham, David Ferguson, Brian Hughes, Sarath Vala, Marco Oddi re RHVP – Upcoming weekend works – July 22, 2018	Not responsive	Yes; no exemptions identified
43	Jul 18, 2018	Email from Robert Del Conte to Robert Marques, Richard Boorsma, John Hanson, Reinaldo Spagnuolo, Tammy Blackburn, Bob Paul, Michael Becke, Terry McCleary, John Searles re RHVP Sunday SB	Not responsive	Yes; no exemptions identified
44	Jul 21, 2018	Email from Michael Becke to Robert Marques re RHVP Recessed Markers Complete	Not responsive	Yes; no exemptions identified

Tab	Date	Description	Responsiveness to Request #1 re Friction Testing (2013-2018)	Responsiveness to Request #2 re Asphalt/Pavement Testing (2016-2018)
45	Jul 30, 2018	Email from Michael Becke to Vimy Henderson, Marco Capobianco re 18100695 RHVP Samples	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption; possible s. 12 Legal Advice exemption to reference involving Procurement and Legal; see orange highlighting in working copy for s. 12 portion
46	Aug 7, 2018	Email from Michael Becke to Diana Cameron re Hot in place – review existing installations	Not responsive	Yes; no exemptions identified
47	Aug 17, 2018	Email from Michael Becke to Robert Marques re HIR of RHVP pavement	Not responsive	Yes; possible s. 7 Advice & Recommendations exemption; and possible s. 10 3rd Party Information exemption
48	Aug 17, 2018	Email from Vimy Henderson to Michael Becke re Sunday	Not responsive	Yes; no exemptions identified
49	Aug 21, 2018	Email from Michael Becke to Mike Becke fwd City of Hamilton – Interest in Hot in Place Recycling & MTO Contract 2017-6029	Not responsive	Yes; no exemptions identified
50	Aug 27, 2018	Email from Ludomir Uzarowski to Michael Becke re RHVP	Yes; possible s. 7 Advice and Recommendations exemption applies	Not responsive
51	Aug 30, 2018	Email from Susan Jacob to Gord McGuire, Michael Becke re Linc / RHVP paving	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption applies
52	Aug 30, 2018	Email from Gord McGuire to Susan Jacob re Linc / RHVP paving	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption applies
53	Sep 7, 2018	Email from Michael Becke to Vimy Henderson re 18100695 RHVP Samples	Not responsive	Yes; no exemptions identified
54	Sep 17, 2018	Email from Richard Andoga to Rodney Aitchison re Linc and RHVP resurfacing – traffic count stations	Not responsive	Yes; no exemptions identified

Tab	Date	Description	Responsiveness to Request #1 re Friction Testing (2013-2018)	Responsiveness to Request #2 re Asphalt/Pavement Testing (2016-2018)
55	Oct 9, 2018	Email from Michael Becke to Gord McGuire re RHVP Investigation Works for HIP – Maintenance support	Not responsive	Yes; no exemptions identified
56	Oct 9, 2018	Email from Michael Becke to Gord McGuire re RHVP Investigation Works for HIP – Maintenance support	REPEAT of TAB 55	
57	Oct 9, 2018	Email from Michael Becke to Ludomir Uzarowski re Enviro Tec HIPR 100% Hot In Place Recycled Asphalt Paving; City of Hamilton 1999 road list pictures	Not responsive	Yes; possible s. 10 3rd Party Information exemption
58	Oct 12, 2018	Email from Sarath Vala to David Ferguson re Red Hill Safety Assessment	Not responsive	Yes; no exemptions identified
59	Oct 14, 2018	Email from David Ferguson to Susan Jacob, Chris Olszewski re RHVP/LINC Collision Stats Update	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption applies
60	Oct 16, 2018	Email from Michael Becke to Ludomir Uzarowski re Thursday Meeting – Discussion topics	Not responsive	Yes; no exemptions identified
61	Oct 23, 2018	Email from Gord McGuire to Michael Becke re Red Hill	Not responsive	Arguably not responsive
62	Oct 24, 2018	Email from Rich Shebib to Gord McGuire re Lincoln Alexander Pkwy; Red Hill Valley	Not responsive	Yes; no exemptions identified
63	Oct 24, 2018	Email from David Ferguson to Susan Jacob, Robert Marques, Bob Paul, Ed Switenky, Michael Becke, Alan J. Jazvac, Jeff Sherriff re RHVP Data Request	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption
64	Oct 24, 2018	Email from Jeff Sherriff to David Ferguson, Susan Jacob, Robert Marques, Bob Paul, Ed Switenky, Michael Becke, Alan J. Jazvac re RHVP Data Request	Not responsive	Yes; possible s. 7 Advice and Recommendations exemption

Tab	Date	Description	Responsiveness to Request #1 re Friction Testing (2013-2018)	Responsiveness to Request #2 re Asphalt/Pavement Testing (2016-2018)
65	Oct 24, 2018	Email from Gord McGuire to Susan Jacob re Spec inquiry – RHVP	Not responsive	Arguably not responsive; and possible s. 7 Advice and Recommendations exemption
66	Nov 1, 2018	Email from Sarath Vala to Michael Becke re RHVP – Resurfacing	Not responsive	Yes; no exemptions identified
67	Nov 2, 2018	Email from David Ferguson to Soroush Salek re RHVP Roadside Safety Assessment	Not responsive	Arguably not responsive
68	Nov 2, 2018	Email from Robert Marques to David Ferguson, Soroush Salek re RHVP Roadside Safety Assessment	Not responsive	Arguably not responsive
69	Nov 7, 2018	Email from Alireza Hadayeghi to Brian Malone, Soroush Salek, Giovani Bottesini, Martin White, David Ferguson, Susan Jacob, Michael Murry, Sarath Vala, Alireza Hadayeghi re B001014 Hamilton RHVP & LINC Roadside Safety Reviews – Kick-Off Meeting Minutes	Not responsive	Arguably not responsive
70	Nov 7, 2018	Email from Michael Becke to Soroush Salek, David Ferguson re RHVP Roadside Safety Assessment	Not responsive	Arguably not responsive
71	Nov 28, 2018	Email from Gord McGuire to Diana Cameron, Dipankar Sharma re RHVP pavement testing results (attached)	Not responsive	Not responsive because document created after the date of the FOI access request and therefore it falls outside of relevant time-frame

IMPORTANT TO NOTE:

1. A copy of the "Red Hill Valley Parkway Safety Review" (October 2013) CIMA report should also be sent to Anne Watson. If this report has already been made public like the 2015 CIMA report, then it should be disclosed in its entirety.
2. Any Committee and Council reports dealing with (i) friction of RHVP (2013-2018) and (ii) asphalt and/or pavement of RHVP (2016-2018) should also be sent to Anne Watson.
3. Any relevant documents located by Mike Becke's office should be sent to Anne Watson (but may need to be reviewed by Legal Services first if there are any concerns about the content of same).
4. Anne Watson should be asked to also consider if there are any other MFIPPA exemptions that may apply to the records at hand (since there may be some that I have not identified and/or she may have a different opinion than me).

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 16, 2018 8:54 PM
To:	McGuire, Gord
Subject:	RE: Red Hill SMA

SOLICITOR-CLIENT PRIVILEGED

Yes, I already have this information too.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-16-18 8:48 PM
To: MacNeil, Byrdena
Subject: FW: Red Hill SMA

More information that I think you already have.

The study attached on pg 4 indicates that after 700 days the FN is at the high 30's similar to the results of the RHVP.

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: Uzarowski, Ludomir <Ludomir_Uzarowski@golder.com>
Sent: December 17, 2015 12:15 PM
To: Moore, Gary <Gary.Moore@hamilton.ca>
Subject: RE: Red Hill SMA

Hi Gary,

Please find attached the November 2013 report from Tradewind Scientific on friction testing on Red Hill Valley Parkway and Lincoln Alexander Parkway. I will look at some standards or anticipated values and call you.

Regards,
Ludomir

Ludomir Uzarowski (Ph.D., P.Eng.) | Principal - Pavement and Materials Engineering | **Golder Associates Ltd.**
6925 Century Avenue, Suite #100, Mississauga, Ontario, Canada L5N 7K2
T: +1 (905) 567 4444 | **D:** +1 905 567 6100 Ext. 1528 | **F:** +1 (905) 567 6561 | **C:** +1 905 441 6044 | **E:** Ludomir_Uzarowski@golder.com | **www.golder.com**

Work Safe, Home Safe

From: Moore, Gary [mailto:Gary.Moore@hamilton.ca]
Sent: December 17, 2015 8:47 AM
To: Uzarowski, Ludomir
Subject: FW: Red Hill SMA

Here's a summary of the skid resistance tests.

Immediately following construction of the RHVP in 2007, the Ontario Ministry of Transportation performed friction testing in both southbound lanes. The following table summarizes the results of this testing.

Lane	Average Friction Number	Friction Number Range
Southbound Lane 1	33.9	28.1 to 36.5
Southbound Lane 2	33.8	28.4 to 37.4

In 2013, the Friction Numbers were measured on the RHVP in both directions by Tradewind Scientific using a Grip Tester. The average FN numbers were as follows:
SB Right Lane 35
SB Left Lane 34
NB Right Lane 36
NB Left Lane 39

Hope this helps

Gary

Gary Moore, P.Eng
Director Engineering Services
Public Works Department
Ext 2382

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: December 16, 2018 8:47 PM
To: McGuire, Gord
Subject: RE: Red Hill SMA

SOLICITOR-CLIENT PRIVILEGED

Hi Gord – yes, that is in the volume of documents I have. Thanks for confirming.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-16-18 8:45 PM
To: MacNeil, Byrdena
Subject: FW: Red Hill SMA

Hi Byrdena:

Have you received this email previously?

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: Moore, Gary
Sent: January 24, 2014 11:59 AM
To: Thomas Dziedziejko <tomdz@amecorp.ca>
Subject: Red Hill SMA

Tom

He are a few pictures of the Red Hill, unfortunately I can't put my hands on any photos of the SMA going down (but it just looks like any other paving job). I have attached a few general Red Hill photo's you can use.

In general the SMA surface course was used as part of the Red Hill perpetual pavement system. Given we have no utilities or municipal appurtances (manholes, catchbasins, vaults, etc..) in the road we felt the extra cost of the SMA and the benefits of the higher skid resistance, reduced water spray, lower noise generation, etc, was warranted and would perform to it intended service life. On most urban roads that would have a high enough traffic volume to warrant a premium asphalt, I would have to consider the condition of any underlying municipal services (watermains and sewers), the potential for utility cuts and the potential service life of the pavement before considering SMA for urban road application.

Here's a summary of the skid resistance tests.

Immediately following construction of the RHVP in 2007, the Ontario Ministry of Transportation performed friction testing in both southbound lanes. The following table summarizes the results of this testing.

Lane	**Average Friction Number**	**Friction Number Range**
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In 2013, the Friction Numbers were measured on the RHVP in both directions by Tradewind Scientific using a Grip Tester. The average FN numbers were as follows:
SB Right Lane 35
SB Left Lane 34
NB Right Lane 36
NB Left Lane 39

Hope this helps

Gary

Gary Moore, P.Eng
Director Engineering Services
Public Works Department
Ext 2382

Ps thoroughly enjoyed event last night! Thanks again Tom.
Gary

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 16, 2018 7:31 PM
To:	McGuire, Gord; Auty, Nicole; Sabo, Ron; McLennan, John
Subject:	CIMA Report 2013 and FOI 18-189 - RHVP
Attachments:	Part 4 of 4 CIMA October 2013 RHVP Safety Review.pdf; Part 3 of 4 CIMA October 2013 RHVP Safety Review.pdf; Part 2 of 4 CIMA October 2013 RHVP Safety Review.pdf; Part 1 of 4 CIMA October 2013 RHVP Safety Review.pdf
Sensitivity:	Confidential

SOLICITOR-CLIENT PRIVILEGED

Attached, for your information and file, please find a copy of the "Red Hill Valley Parkway Safety Review" prepared by CIMA in October 2013 (am sending in 4 parts).

This has been produced to plaintiff's counsel as part of the City's AOD in the *Hansen* litigation being handled by Dana Lezau (Court File No.: 17-61728). Note that the report recommends that the City should perform friction testing.

Gord, it appears to me that this record is responsive to the FOI 18-189 access request, in the same way that the 2015 CIMA report is responsive. The 2013 report is also mentioned in the 2015 report at page 2 (para. 1) wherein it states:

"...In 2013, CIMA Canada Inc. (CIMA) conducted a safety review of the section of the RHVP between the Dartnall Road and Greenhill Avenue interchanges, providing a series of recommendations to improve safety."

I would recommend that this 2013 CIMA report be included in the volume of documents that are provided to Anne Watson in response to FOI 18-189.

Thanks,
Byrdena

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 12, 2018 5:06 PM
To:	Auty, Nicole; Sabo, Ron; McLennan, John
Subject:	FW: Asphalt VFM audit summary and actions to date:
Attachments:	image003.jpg; ATT00001.htm; image003.jpg; ATT00002.htm; STATEMENT OF SCOPE & OBJECTIVES - Roads Deterioration 2.docx; ATT00003.htm

FYI ...

I don't know why the attachments aren't opening in the email itself. The main ones, as far as I can tell, are "ATT00001.htm (15KB)" which is Gord's document, and the "Statement of Scope & Objectives" which I presume is Audit's document.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-12-18 3:58 PM
To: MacNeil, Byrdena
Subject: Fwd: Asphalt VFM audit summary and actions to date:

Hi Byrdena.

FYI and your file as I had sent this to the GM PW on our audit process and review.

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: December 12, 2018 11:19 AM
To: McGuire, Gord
Cc: Sabo, Ron
Subject: FOI 18-189 RHVP

Importance: High
Sensitivity: Confidential

SOLICITOR-CLIENT PRIVILEGED

Hi Gord,

Ron and I were speaking about the RHVP FOI request after you and I had spoken yesterday. I advised him that we have the records relevant to the first part of the request (friction testing) from your office already but that the documents from the second part of the request (asphalt/pavement testing) are coming from Mike Becke's office.

If at all possible, we believe that completing the document search for the access request needs to be the top priority for Mike Becke's office at this point in time given:

(i) that the request was submitted by Access & Privacy back in October; and
(ii) it is important and best for us to have located all of the relevant documents before any report to Council goes ahead (which could be soon).

Is this something I should contact Mike Becke directly about or is there someone else who I should go through first?

Thanks,
Byrdena

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: December 12, 2018 10:51 AM
To: Sabo, Ron; McLennan, John
Subject: FW: Audit Issue

Sensitivity: Confidential

Another fyi …

Nicole was copied on the original email.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-11-18 4:31 PM
To: MacNeil, Byrdena; Auty, Nicole
Subject: FW: Audit Issue
Sensitivity: Confidential

More FYI

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: McKinnon, Dan
Sent: December 11, 2018 4:25 PM
To: McGuire, Gord <Gord.McGuire@hamilton.ca>
Subject: Fwd: Audit Issue
Sensitivity: Confidential

FYI

Sent from my iPhone

Begin forwarded message:

From: "McKinnon, Dan" <Dan.McKinnon@hamilton.ca>
Date: December 11, 2018 at 4:23:04 PM EST
To: "Brown, Charles" <Charles.Brown@hamilton.ca>
Subject: Re: Audit Issue

Hi Charles I'm happy to discuss but I have to tell you we need some appreciation for our work load at the moment. We are in the middle of capital budgets, Gord is in his position all of five months and has a key position vacant that being the manager of asset management which is critical to getting the budget approved. We are also currently responding to an FOI for the RHVP and organizing effort to respond to that. We will happily comply with your request but we need some time. Would you like me to organize a phone call?

Sent from my iPhone

On Dec 11, 2018, at 2:59 PM, Brown, Charles <Charles.Brown@hamilton.ca> wrote:

Dan

I am contacting you about the situation we have in our audit of Road Construction/Capital. We have reached an impasse on the issue of fulsome access to information respecting certain testing of pavement friction on Red Hill Cr Pkwy.

When we first asked for relevant consulting reports, we were given a report with redacted sections. When that got resolved, and we asked to meet with Gord McGuire to discuss further enquiries related to its content, we were advised this wasn't possible until January. We had provided a list of questions, presuming that at least a discussion of the situation with each question and the evidence we needed would facilitate better understanding, and help minimize the information burden. A half hour meeting was set up.

When my staff member came to the meeting however, Gord McGuire refused to answer any questions pertaining to this matter, or discuss it. Discussion about this issue having been shut down, the meeting ended.

This puts us in an untenable position which needs to be resolved. To that end I will be sending Gord an official notice of my request for the information. In the meantime I was hoping that you could intervene to effect a timely resolution. I've been keeping Mike Zegarac apprised of my thoughts and intentions on this matter, which is that we need to go deeper into the facts and circumstances surrounding the issue, insofar as what the situation was and is, and the processes that have been followed.

I am hopeful this can be resolved quickly and we can resume our work.

Thanks for your assistance.

Charles

Charles Brown
Director of Audit Services
City Manager's Office
City of Hamilton
77 James St. N., Suite 400, Hamilton, ON - L8R 2K3
Phone: 905-546-2424 ext. 4469
Fax: 905-546-2573
Email: Charles.Brown@hamilton.ca

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 12, 2018 10:49 AM
To:	Sabo, Ron; McLennan, John
Subject:	FW: Audit memo
Attachments:	Memo - Re Roads Construction.pdf
Importance:	High
Sensitivity:	Confidential

Just FYI

Nicole was copied on the original email from Gord.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-11-18 4:28 PM
To: MacNeil, Byrdena; Auty, Nicole
Subject: FW: Audit memo
Importance: High
Sensitivity: Confidential

FYI...

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: Brown, Charles
Sent: December 11, 2018 4:11 PM

To: McGuire, Gord <Gord.McGuire@hamilton.ca>
Cc: McKinnon, Dan <Dan.McKinnon@hamilton.ca>; Zegarac, Mike <Mike.Zegarac@hamilton.ca>
Subject: Audit memo
Sensitivity: Confidential

Please see the attached memo

Thanks

Charles Brown

Director of Audit Services
City Manager's Office
City of Hamilton
77 James St. N., Suite 400, Hamilton, ON - L8R 2K3
Phone: 905-546-2424 ext. 4469
Fax: 905-546-2573
Email: Charles.Brown@hamilton.ca

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: December 10, 2018 1:02 PM
To: Sabo, Ron; Auty, Nicole; McLennan, John
Subject: RE: RHVP

Sensitivity: Confidential

SOLICITOR-CLIENT PRIVILEGED

Agreed, Ron. I did tell Gord that this really should be bumped up to Dan McKinnon (and/or Mike Zegarac) to put the brakes on the Audit meeting at this point in time. However, it did not appear that that was going to happen before the 1:30 p.m. meeting. Hence, why I gave him the advice I did.

Also, I forgot to say in my previous email that Gord mentioned that Edward Soldo, Director of Roads and Traffic, is now perhaps questioning using CIMA for future matters relating to the RHVP given the relationship between Brian Malone of CIMA and the fact that his wife, Betty Matthews-Malone, was the (former?) Director-Operations at the City of Hamilton during the years we are now reviewing as it relates to friction testing on the RHVP. It may be raised what information was shared or not shared between CIMA and the City as a result of this relationship. As well, even if everything was done perfectly, the City is still left with the optics of the relationship. Obviously, Edward would have to speak for himself on this though.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Sabo, Ron
Sent: December-10-18 12:45 PM
To: MacNeil, Byrdena
Cc: Auty, Nicole; McLennan, John
Subject: Re: RHVP
Sensitivity: Confidential

Sorry to be doing this by email and I am a bit fuzzy headed today so take comments with a grain of salt; I don't like the optics if Gord goes away saying Legal said to cancel but I agree he should postpone if he's not actually able to answer and give that as his reason. Audit here is internal and just doing their work. If he hasnt already he should bump this up within PW as the questions posed are ones the City may have to answer internally in

short term and possibly transparently in near term. It would be much better for PW to get on top of full background and decisions on any reporting that needs to be done.
There will certainly be legal issues raised in potential and existing, possibly even concluded, litigation of multiple sorts but the road engineers etc need to weigh in on circumstances and appropriate responses.

R. A. Sabo
Deputy City Solicitor, Dispute Resolution
Legal and Risk Management Services, Corporate Services
City of Hamilton
Office Phone 905 546 2424 ext. 3143
Fax 905 546 4370

City Of Hamilton
Legal and Risk Management Services
City Hall
71 Main Street West
Hamilton, ON
L8P 4Y5

Physical Office: 50 Main St. East, 4th Floor, Hamilton, ON

On Dec 10, 2018, at 12:17, MacNeil, Byrdena <Byrdena.MacNeil@hamilton.ca> wrote:

> SOLICITOR-CLIENT PRIVILEGED
>
> Gord McGuire telephoned me this morning. He has a meeting today with Dominic Pellegrini from Audit at 1:30 p.m. He is concerned about answering any of Dominic's questions (attached) but also doesn't want to be criticized for obstructing the Audit Office in their job. I advised him that it was far better for Dominic to be upset about not getting any answers today than it would be for Gord to try and provide even limited information. I advised Gord that he should cancel the meeting but if he doesn't cancel the meeting, he should simply listen to Dominic's concerns and questions but his answer to all of the pertinent questions needs to be "I am not in a position today to provide you with any answers to those questions."
>
> Of note, Gord mentioned that, over the weekend, he reviewed a Draft 2018 CIMA report dealing with a safety analysis/review of the RHVP. It appears that the report indicates that wet weather performance of the RHVP has worsened since CIMA's 2015 report.
>
> Gord mentioned that Roads and Traffic have put a number of safety reports to Council over the years dealing with the RHVP. I advised him that I became aware of (some of) these Council reports after I spoke with Dana Lezau this past Friday about litigation that

she is handling on behalf of the City – *Hansen v. Bernat and City of Hamilton* (Court File No.: 17-61728), and I reviewed the affidavit of documents served by the City in that litigation. I note that there are a number of paragraphs in those reports devoted to improving “safety and reducing collisions” on the RHVP, primarily focussing on reducing speeding and increasing aggressive driving enforcement and improving signage (which are all good things) but nowhere is it mentioned about any issue or concern with the friction of the road. (I did not tell Dana any details about the FOI access request or the documents discovered therein as I think that is best coming from Ron and/or Nicole.)

Finally, please note that Marco Oddi, Manager, Constructions Services (Roads) was examined for discovery on Friday, December 7th, in the *Hansen v. Bernat* matter and gave answers as to the state of the RHVP. I do not know what his answers were but they would bind the City.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

<Lines of Enquiry.xls>

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 10, 2018 12:17 PM
To:	Auty, Nicole; Sabo, Ron; McLennan, John
Subject:	RHVP
Attachments:	Lines of Enquiry.xls
Importance:	High
Sensitivity:	Confidential

SOLICITOR-CLIENT PRIVILEGED

Gord McGuire telephoned me this morning. He has a meeting today with Dominic Pellegrini from Audit at 1:30 p.m. He is concerned about answering any of Dominic's questions (attached) but also doesn't want to be criticized for obstructing the Audit Office in their job. I advised him that it was far better for Dominic to be upset about not getting any answers today than it would be for Gord to try and provide even limited information. I advised Gord that he should cancel the meeting but if he doesn't cancel the meeting, he should simply listen to Dominic's concerns and questions but his answer to all of the pertinent questions needs to be "I am not in a position today to provide you with any answers to those questions."

Of note, Gord mentioned that, over the weekend, he reviewed a Draft 2018 CIMA report dealing with a safety analysis/review of the RHVP. It appears that the report indicates that wet weather performance of the RHVP has worsened since CIMA's 2015 report.

Gord mentioned that Roads and Traffic have put a number of safety reports to Council over the years dealing with the RHVP. I advised him that I became aware of (some of) these Council reports after I spoke with Dana Lezau this past Friday about litigation that she is handling on behalf of the City – *Hansen v. Bernat and City of Hamilton* (Court File No.: 17-61728), and I reviewed the affidavit of documents served by the City in that litigation. I note that there are a number of paragraphs in those reports devoted to improving "safety and reducing collisions" on the RHVP, primarily focussing on reducing speeding and increasing aggressive driving enforcement and improving signage (which are all good things) but nowhere is it mentioned about any issue or concern with the friction of the road. (I did not tell Dana any details about the FOI access request or the documents discovered therein as I think that is best coming from Ron and/or Nicole.)

Finally, please note that Marco Oddi, Manager, Constructions Services (Roads) was examined for discovery on Friday, December 7th, in the *Hansen v. Bernat* matter and gave answers as to the state of the RHVP. I do not know what his answers were but they would bind the City.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: December 10, 2018 10:34 AM
To: McGuire, Gord
Subject: RE: RHVP

SOLICITOR-CLIENT PRIVILEGED

Hi Gord,

Thanks for your email. No, we have not contacted CIMA yet because we are still working on how we are going to put the request to them in order to best move forward from a legal perspective.

I would strongly advise that you not speak with CIMA about this matter until you have heard back from us/Nicole. We should be able to update you this week (I hope by mid-week).

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-08-18 4:53 PM
To: MacNeil, Byrdena
Subject: FW: RHVP

Hi Byrdena:

Did you get a hold of the CIMA contact via Edward?

I was wondering and if so could I talk to CIMA confidentially.

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: Brian Malone <Brian.Malone@cima.ca>
Sent: December 8, 2018 4:37 PM
To: McGuire, Gord <Gord.McGuire@hamilton.ca>
Subject: Re: RHVP

No they have not contacted me. Have they called the office.

BRIAN MALONE, P.Eng., PTOE
Partner / Vice President, Transportation / Traffic Engineering

T 289-288-0287 ext. 6802 **M** 905-466-0421
3027 Harvester Road, Suite 400, Burlington, Ontario, L7N 3G7 CANADA

On Dec 8, 2018, at 13:55, McGuire, Gord <Gord.McGuire@hamilton.ca> wrote:

Hi Brian. Did our legal group get in touch with you on the safety report?

Thanks

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: December 7, 2018 2:30 PM
To: McLennan, John
Subject: RHVP

Sensitivity: Confidential

Hi John,

Can you please let me know when you are back in your office? I have your copy of the documents. Thanks.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 7, 2018 11:24 AM
To:	Auty, Nicole
Subject:	FW: RHVP
Attachments:	Part 1 of 6 Performance Review after Six Years of Service.pdf

Here is Part 1 of 6 of the Golder Report

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Delry, Pam
Sent: December-07-18 11:14 AM
To: MacNeil, Byrdena
Subject: RHVP

Hamilton
City of Hamilton
Legal and Risk Management Services
Mailing Address: City Hall
71 Main Street West
Hamilton, ON Canada L8P 4Y5
www.hamilton.ca

Pam Delry
Legal Assistant
Legal and Risk Management Services, Corporate Services
City of Hamilton
Phone: 905.546.2424 ext. 3981
Fax: 905.546.4370
Courier/Service Address: 50 Main Street East, 5th Flr, Hamilton, ON L8N 1E9

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: December 7, 2018 11:03 AM
To: Auty, Nicole
Subject: RHVP Reports for Outside Counsel's Review
Attachments: Tradewind Scientific Report (January 2014).pdf; RHVP Pavement Testing Results Nov 28, 2018.pdf; CIMA Report (November 2015).pdf

Sensitivity: Confidential

Hi Nicole,

Further to our discussion of this morning, here are three of the four main reports (as identified by Gord McGuire) in electronic version:

1. Tradewind Scientific Report (January 2014)
2. CIMA Report (November 2015)
3. RHVP Pavement Testing Results Nov 28, 2018

I have to send the fourth report – Golder Report (Draft) on Performance Review - in parts because it is too large as a whole. So I will send that by way of separate emails.

Thanks,
Byrdena

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 7, 2018 10:30 AM
To:	McGuire, Gord
Cc:	Auty, Nicole
Subject:	RE: Safety Analysis of the Red Hill Valley Parkway

Thanks, Gord.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-07-18 10:06 AM
To: MacNeil, Byrdena; Auty, Nicole
Subject: Fwd: Safety Analysis of the Red Hill Valley Parkway

FYI on the RHVP internal audit.

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

Begin forwarded message:

From: "McGuire, Gord" <Gord.McGuire@hamilton.ca>
Date: December 7, 2018 at 10:03:49 AM EST
To: "Pellegrini, Domenic" <Domenic.Pellegrini@hamilton.ca>
Cc: "McKinnon, Dan" <Dan.McKinnon@hamilton.ca>, "Minard, Brigitte" <Brigitte.Minard@hamilton.ca>, "Brown, Charles" <Charles.Brown@hamilton.ca>
Subject: Re: Safety Analysis of the Red Hill Valley Parkway

Thanks Domenic.

Given that I'm in tax capital budget today where GIC just deferred approval until mid January and I will be reacting to the expected requests from council my schedule will be occupied by this until council approval. I won't be able to turn my attention to your requests in the immediate term.

As well there is significant effort being undertaken to respond to the ongoing MFIPPA request as previously detailed.

My remaining vacation schedule is also crowding out working days in 2018.

After I get through the budget and MFIPPA I will be able to turn my attention to this request. I suggest we defer until January 2019 and reconnect.

Thanks in advance.

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

On Dec 7, 2018, at 9:37 AM, Pellegrini, Domenic <Domenic.Pellegrini@hamilton.ca> wrote:

> Good morning Dan and Gord,
>
> I was hoping to meet with Gord on Monday December 10th. Present the Lines of Enquiry document attached to the email sent yesterday and from there determine how much work is required so as to assess a realistic project deadline.

Thus far I've only received a tentative acceptance to my meeting request.

Thanks

Domenic Pellegrini CPA, CMA, CIA
Senior Internal Auditor
Audit Services Division
City Manager's Office, City of Hamilton
T: (905) 546-2424 Ext. 2207

Domenic.Pellegrini@hamilton.ca

From: McKinnon, Dan
Sent: December-07-18 7:14 AM
To: Pellegrini, Domenic
Subject: Fwd: Safety Analysis of the Red Hill Valley Parkway

Hi Domenic, what deadline are you working toward as it is an extraordinarily busy time at the moment? Budgets, this large FOI request and the fact that Gord does not currently have a manager of asset management is creating significant pressures.

Sent from my iPhone

Begin forwarded message:

> **From:** "McGuire, Gord" <Gord.McGuire@hamilton.ca>
> **Date:** December 6, 2018 at 5:02:26 PM EST
> **To:** "McKinnon, Dan" <Dan.McKinnon@hamilton.ca>
> **Subject: FW: Safety Analysis of the Red Hill Valley Parkway**

FYI re: the audit and my ability to respond. I will need to be engaed in the MFIPPA reposne in the short term.

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 6, 2018 5:17 PM
To:	Auty, Nicole
Cc:	Sabo, Ron
Subject:	FW: Safety Analysis of the Red Hill Valley Parkway
Attachments:	Lines of Enquiry.xls
Importance:	High

Just fyi, questions being asked by Audit (see attachment).

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-06-18 5:04 PM
To: MacNeil, Byrdena
Subject: FW: Safety Analysis of the Red Hill Valley Parkway
Importance: High

FYI and as discussed..

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: Pellegrini, Domenic
Sent: December 6, 2018 3:07 PM
To: McGuire, Gord <Gord.McGuire@hamilton.ca>
Cc: Minard, Brigitte <Brigitte.Minard@hamilton.ca>; Brown, Charles <Charles.Brown@hamilton.ca>

Subject: FW: Safety Analysis of the Red Hill Valley Parkway
Importance: High

Hi Gord,

Further to my meeting request from earlier today, please refer to the attached document for the questions and concerns that I would like to touch on for our upcoming meeting.

Thanks

Domenic Pellegrini CPA, CMA, CIA
Senior Internal Auditor
Audit Services Division
City Manager's Office, City of Hamilton
T: (905) 546-2424 Ext. 2207

Domenic.Pellegrini@hamilton.ca

From: Pellegrini, Domenic
Sent: December-06-18 9:35 AM
To: McGuire, Gord
Cc: Minard, Brigitte; Brown, Charles
Subject: Safety Analysis of the Red Hill Valley Parkway
Importance: High

Good morning Gord,

Audit Services has come across a report that appears to have been approved by Traffic Operations regarding the safety of the Red Hill Valley Parkway. The Report is entitled "Red Hill Valley Parkway Detailed Safety Analysis", completed in November 2015. Can we have a copy of this report? Would you know whether the recommendations made by this report been implemented?

Also, could you please provide information on any other reports regarding the safety of the Red Hill Valley Parkway especially if they relate to the slipperiness of the pavement?

Thanks in advance for your assistance.

Domenic Pellegrini CPA, CMA, CIA
Senior Internal Auditor
Audit Services Division
City Manager's Office, City of Hamilton
T: (905) 546-2424 Ext. 2207

Domenic.Pellegrini@hamilton.ca

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 4, 2018 5:49 PM
To:	Auty, Nicole
Cc:	Sabo, Ron
Subject:	RHVP Reports
Attachments:	CIMA Report (November 2015).pdf; Tradewind Scientific Report (January 2014).pdf
Sensitivity:	Confidential

STRICTLY CONFIDENTIAL

Hi Nicole,

Further to our discussion of this afternoon, here are two of the four key reports. The third one (Golder) is very large and still hasn't appeared in my inbox yet although scanned. I will send it and the fourth (smaller one) along to you tomorrow.

Thanks,
Byrdena

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 4, 2018 2:13 PM
To:	Auty, Nicole; Sabo, Ron
Subject:	FW: RE: Redhill Valley Expressway Report
Importance:	High

FYI

In my discussion with Gord today, I asked whether there was a possibility that the Audit department could inadvertently release information about the friction testing reports that could end up being discovered by any councillors before there has been a chance by PW and/or Legal Services to report on the issue to Council. We had no answer between us so I am raising it with you.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-04-18 1:57 PM
To: MacNeil, Byrdena
Cc: McKinnon, Dan
Subject: FW: RE: Redhill Valley Expressway Report
Importance: High

Hi Byrdena:

As per our conversation today re: the copying of our MFIPPA related documents by the auditor.

We had discussed the concerns about the sensitivity of our materials responsive to the RHVP friction testing MFIPPA request (external) and the overlap with the auditors current value for money audit on our asphalts (City Wide and internal). The value for money audit has been underway for a few months and we had not yet fully assembled the performance, QA and technical documentation to respond.

The position you had advised was to provide the auditor our 2014 Golder RHVP report records on the RHVP inclusive of the condition assessment. But we would redact the friction testing related materials until such time as the MFIPPA response had been fully analyzed.

Our position was to offer the auditor reading access to the file at my office. That is laid out below in my email to Domenic. Once the MFIPPA access had been determined then we would release the document in its entirety.

However today the auditor visited my office while I was in a meeting and made copies of the report. He mentioned that staff allowed it but I had previously discussed access to these files with him and thought that our approach was understood.

I'm concerned that the audit now has records that may be released prior to our MFIPPA response. This may influence our position on this file, I may be over reacting but feel this is an element that requires some higher level understanding. As such I've copied Dan McKinnon.

Can you advise of our possible next steps.

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: McGuire, Gord
Sent: December 4, 2018 11:08 AM
To: Auty, Nicole <Nicole.Auty@hamilton.ca>
Subject: FW: RE: Redhill Valley Expressway Report

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: McGuire, Gord
Sent: December 3, 2018 4:26 PM
To: Pellegrini, Domenic <Domenic.Pellegrini@hamilton.ca>; Sharma, Dipankar <Dipankar.Sharma@hamilton.ca>
Cc: Brown, Charles <Charles.Brown@hamilton.ca>; Minard, Brigitte <Brigitte.Minard@hamilton.ca>; Cameron, Diana <Diana.Cameron@hamilton.ca>; MacNeil, Byrdena <Byrdena.MacNeil@hamilton.ca>
Subject: RE: RE: Redhill Valley Expressway Report

Hi Domenic:

Possibly there is some miscommunication here and we are happy to have you review the file . We have a copy here and you can arrange with Diana to come and see the copy. The Solicitor on the file is cc'd as well, and she is Byrdena MacNeil.

The data we have withheld, at Legal Services advise, is related to friction testing and subject to an FOI / MFIPPA request on that subject. There is ongoing and pending litigation on this matter and we're following their advice. The MFIPPA process will be shorter than months from my understanding.

We have redacted the paragraphs and there is one appendix of 13 pages related to the friction characteristics that we discussed and as noted are available here for your review.

Please contact Diana for access to this file.

Thanks

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: Pellegrini, Domenic
Sent: December 3, 2018 4:11 PM
To: Sharma, Dipankar <Dipankar.Sharma@hamilton.ca>; McGuire, Gord <Gord.McGuire@hamilton.ca>
Cc: Brown, Charles <Charles.Brown@hamilton.ca>; Minard, Brigitte <Brigitte.Minard@hamilton.ca>
Subject: RE: RE: Redhill Valley Expressway Report
Importance: High

Good afternoon Gord and Dipankar,

In order to properly understand the analysis and recommendations made by the Consultant (Golder Associates) on the state of the Redhill Valley Expressway, Audit Services needs to see the un-redacted version of the report. We cannot wait until Legal Services has completed their review. This process may take months and will have an impact on Audit Services completing its review!

If this presents a problem, please provide the name of the Solicitor in Legal Services that advised you of this so that Audit Services may discuss this matter directly with the Solicitor. As it is two whole paragraphs have been redacted impacting the analysis and recommendation made by the Consultant.

Thank you in advance for your assistance on this matter.

Domenic Pellegrini CPA, CMA, CIA
Senior Internal Auditor

Audit Services Division
City Manager's Office, City of Hamilton
T: (905) 546-2424 Ext. 2207

Domenic.Pellegrini@hamilton.ca

From: Sharma, Dipankar
Sent: November-27-18 10:06 AM
To: Pellegrini, Domenic
Cc: McGuire, Gord
Subject: RE: Redhill Valley Report

Hi Domenic,

The Redhill report that redacted as advised by legal. Engineering service received a FOI on Redhill; the complete report and other related documents are currently being reviewed by Legal. Once this review is complete, we will provide the complete/non-redacted package for your review.

Should you have any questions, please feel free to give me a call.

Thank you

Hamilton

Dipankar Sharma, PMP, P.ENG.
Senior Project Manager
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 3016
diana.cameron@hamilton.ca

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 4, 2018 1:56 PM
To:	'McGuire, Gord'
Cc:	Auty, Nicole; Sabo, Ron
Subject:	FW: AC8141, Your File # 055807
Attachments:	AC8141, Letter to City of Hamilton, Dec 4, 2018.pdf

SOLICITOR-CLIENT PRIVILEGED

Okay. Thanks for letting us know, Gord.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: December-04-18 1:52 PM
To: MacNeil, Byrdena
Subject: FW: AC8141, Your File # 055807

More interest in the RHVP files.

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

From: Jacob, Susan
Sent: December 4, 2018 1:50 PM
To: McGuire, Gord <Gord.McGuire@hamilton.ca>
Subject: FW: AC8141, Your File # 055807

Regards

Susan

From: Marques, Robert
Sent: December-04-18 1:03 PM
To: Lagana, Dominic; Paul, Bob; Searles, John
Cc: Jacob, Susan; Soldo, Edward
Subject: FW: AC8141, Your File # 055807

Dominic,

I've copied Susan Jacob on this email to assist you with a response.

Susan's group would oversee any testing from the Redhill and provide comment on why it is being redone.

Bob

From: Lagana, Dominic
Sent: December 4, 2018 1:01 PM
To: Searles, John <John.Searles@hamilton.ca>
Cc: Paul, Bob <Bob.Paul@hamilton.ca>; Marques, Robert <Robert.Marques@hamilton.ca>
Subject: FW: AC8141, Your File # 055807

Hi John :

Please see attached letter our office received from the Insurance Adjuster representing the trucking company concerning the MVA on Red Hill. On Nov 22, 2018.

Sincerely

Hamilton
City of Hamilton
Legal and Risk Management Services
City Hall
71 Main Street West
Hamilton, ON Canada L8P 4Y5
www.hamilton.ca

Dominic Lagana, C.I.P.

Claims Analyst
Legal and Risk Management Services, Corporate Services
City of Hamilton
Phone: 905-546-2424 ext. 5739
Fax: 905.540-5744
Physical Office: 50 Main St. East, 4th Floor, Hamilton, ON

From: Sean Adamson [mailto:sean@adamsonclaims.com]
Sent: Tuesday, December 04, 2018 12:29 PM
To: Lagana, Dominic
Subject: AC8141, Your File # 055807

Hello, Dominic, please refer to the attached, thanks.

Sean Adamson, BSc, CIP
Adamson Claims Services Inc.
PO Box 99012, Heritage Green
Stoney Creek, On, L8J 2P7
sean@adamsonclaims.com
(B) 905-560-4920
(C) 289-253-7409
www.adamsonclaims.com

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 3, 2018 12:30 PM
To:	Auty, Nicole
Subject:	RE: RHVP MFIPPA

Yes. Will do. Thx.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Auty, Nicole
Sent: December-03-18 12:30 PM
To: MacNeil, Byrdena
Subject: RE: RHVP MFIPPA

Yes, can you come by around 130?

Hamilton
City of Hamilton
Legal and Risk Management Services
Mailing address: City Hall
71 Main Street West
Hamilton, ON Canada L8P 4Y5
www.hamilton.ca

Nicole Auty
City Solicitor
Legal and Risk Management Services
Phone: 905.546.2424 ext. 4636
Fax: 905.546.4370
Physical Office: 50 Main St. East, 5th Floor, Hamilton, ON

From: MacNeil, Byrdena
Sent: December-03-18 12:25 PM
To: Auty, Nicole
Subject: RE: RHVP MFIPPA

Hi Nicole,

Will you have time this afternoon to speak about the RHVP matter?

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Auty, Nicole
Sent: November-30-18 10:11 AM
To: MacNeil, Byrdena
Subject: RHVP MFIPPA

Byrdena,

I am working from home today, can you let me know when you're available to speak about the RHVP MFIPPA file, we can talk today on the phone or I'm back in the office Monday.

Hamilton
City of Hamilton
Legal and Risk Management Services
Mailing address: City Hall
71 Main Street West
Hamilton, ON Canada L8P 4Y5
www.hamilton.ca

Nicole Auty
City Solicitor
Legal and Risk Management Services
Phone: 905.546.2424 ext. 4636
Fax: 905.546.4370
Physical Office: 50 Main St. East, 5th Floor, Hamilton, ON

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	December 3, 2018 12:25 PM
To:	Auty, Nicole
Subject:	RE: RHVP MFIPPA

Hi Nicole,

Will you have time this afternoon to speak about the RHVP matter?

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Auty, Nicole
Sent: November-30-18 10:11 AM
To: MacNeil, Byrdena
Subject: RHVP MFIPPA

Byrdena,

I am working from home today, can you let me know when you're available to speak about the RHVP MFIPPA file, we can talk today on the phone or I'm back in the office Monday.

Hamilton
City of Hamilton
Legal and Risk Management Services
Mailing address: City Hall
71 Main Street West
Hamilton, ON Canada L8P 4Y5
www.hamilton.ca

Nicole Auty
City Solicitor
Legal and Risk Management Services
Phone: 905.546.2424 ext. 4636
Fax: 905.546.4370
Physical Office: 50 Main St. East, 5th Floor, Hamilton, ON

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	November 30, 2018 12:16 PM
To:	Auty, Nicole
Subject:	RE: RHVP MFIPPA

Hi Nicole – sorry for the delay in getting back to you – crazy morning! Are you still available this afternoon to chat? I am just going to take my lunch now but can talk at 1:00 pm or thereafter … Otherwise, I am in the office on Monday (but meeting with Gord McGuire first thing that morning at his office.)

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Auty, Nicole
Sent: November-30-18 10:11 AM
To: MacNeil, Byrdena
Subject: RHVP MFIPPA

Byrdena,

I am working from home today, can you let me know when you're available to speak about the RHVP MFIPPA file, we can talk today on the phone or I'm back in the office Monday.

Hamilton
City of Hamilton
Legal and Risk Management Services
Mailing address: City Hall
71 Main Street West
Hamilton, ON Canada L8P 4Y5
www.hamilton.ca

Nicole Auty
City Solicitor
Legal and Risk Management Services
Phone: 905.546.2424 ext. 4636
Fax: 905.546.4370
Physical Office: 50 Main St. East, 5th Floor, Hamilton, ON

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: November 30, 2018 10:25 AM
To: Cameron, Diana; McGuire, Gord
Subject: RE: Material for Monday

Received, thanks!

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Cameron, Diana
Sent: November-30-18 9:18 AM
To: McGuire, Gord; MacNeil, Byrdena
Subject: RE: Material for Monday

Currently being delivered by a student. You should receive the envelope shortly.

Regards,

Hamilton

Diana Cameron
Administrative Assistant II
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 4867
diana.cameron@hamilton.ca

From: McGuire, Gord
Sent: November-30-18 8:59 AM
To: MacNeil, Byrdena
Cc: Cameron, Diana
Subject: Material for Monday

Hi Byrdena:

I'm sending over some additional documents on the RHVP that refer to the FOI request.

If you have questions please call.

My cell is [redacted] if you cant reach my office line.

Thanks

Hamilton

Gord McGuire, O.L.S., B.Sc.
Director, Engineering Services
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 2439
gord.mcguire@hamilton.ca

Accepted: RHVP review - Meeting Response

Mon 11/26/18 4:29 PM

MacNeil, Byrdena

Accepted: RHVP review

To	McGuire, Gord
When	December 3, 2018 9:00 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).
Location	My office
Accepted	No attendees have accepted.
Tentative	No attendees have tentatively accepted.
Declined	No attendees have declined.

MacNeil, Byrdena has accepted this meeting.

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: November 22, 2018 11:21 AM
To: McGuire, Gord; Watson, Anne
Subject: FOI 18-189 - RHVP

Sensitivity: Confidential

SOLICITOR-CLIENT PRIVILEGED

Hi Gord and Anne,

Gord - Just to update you, Anne Watson and I spoke this morning about the RHVP access request and the Information Sheet sent to her setting out our request for a time extension. Unfortunately, it turns out that Anne was also expecting to be sent documents located by your office in a sample search so that she could prepare a letter to the requester setting out a fee estimate and time extension to deal with the request. As you may recall from one of our conversations, Anne and I had discussed doing the sample search but I thought it was only relevant to you being able to properly estimate (in order to complete the Information Sheet) the additional time your office would need to locate and review responsive documents. I have explained to Anne that this misunderstanding was my fault since I had only envisioned a time extension letter going out to the requester, and not any fee request respecting the estimated volume of documents (for which she needed the sample search documents).

Anne – I hope I cleared things up and I apologize again for the misunderstanding.

Thanks,
Byrdena

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	November 14, 2018 6:25 PM
To:	Cameron, Diana
Subject:	RE: RHVP
Sensitivity:	Confidential

Okay, thanks, Diana! Gord and I connected by phone.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Cameron, Diana
Sent: November-14-18 4:49 PM
To: MacNeil, Byrdena
Subject: RE: RHVP
Sensitivity: Confidential

Hi Byrdena,
Gord was not available at 4:15 but if you are available now you can reach out to him on his cell at [redacted]

Hamilton

Diana Cameron
Administrative Assistant II
Public Works Department | Engineering Services Division |

City of Hamilton
77 James Street North, Suite 320
Hamilton, ON L8R 2K3
T: 905.546.2424, Extension 4867
diana.cameron@hamilton.ca

From: MacNeil, Byrdena
Sent: November-14-18 1:14 PM
To: McGuire, Gord

Subject: RHVP
Sensitivity: Confidential

SOLICITOR-CLIENT PRIVILEGED

Hi Gord,

I received the package, thanks. I will quickly review it. I have two meetings this afternoon until probably 4:15 pm. Are you able to chat after that?

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: November 14, 2018 1:14 PM
To: McGuire, Gord
Subject: RHVP

Sensitivity: Confidential

SOLICITOR-CLIENT PRIVILEGED

Hi Gord,

I received the package, thanks. I will quickly review it. I have two meetings this afternoon until probably 4:15 pm. Are you able to chat after that?

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: November 14, 2018 9:49 AM
To: Sabo, Ron
Subject: FW: FOI #18-189 - RHVP Friction testing request - Meet with Legal Services
Attachments: RE: Red Hill SMA; Red Hill SMA; FW: Friction on SMA on Hamilton's Red Hill Valley Parkway; Red Hill Counts; Hamilton_LA-RHV_Rev2.doc; Red hill review GMC Summary.doc

Sensitivity: Confidential

As discussed, here is what I have received to date.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: November-11-18 7:23 PM
To: MacNeil, Byrdena
Subject: RE: FOI #18-189 - RHVP Friction testing request - Meet with Legal Services
Sensitivity: Confidential

Hi Byrdena:

Please see a series of attachments re: this file.

I have summarized the events as best as I can in the attachment labelled Red Hill Review GMc.

Please contact me about times to review.

Regards

Gord McGuire O.L.S., B.Sc.
Director of Engineering Services
Public Works
905-546-2424 x2439

From: MacNeil, Byrdena
Sent: November 9, 2018 3:04 PM
To: McGuire, Gord <Gord.McGuire@hamilton.ca>
Subject: FW: FOI #18-189 - RHVP Friction testing request
Importance: High
Sensitivity: Confidential

SOLICITOR-CLIENT PRIVILEGED

Hi Gord,

Ron Sabo has asked me to assist you with the matter below. Do you have time to chat on Monday, November 12th? I am free any time after 10:30 a.m.

Thanks,
Byrdena

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: November-08-18 11:04 AM
To: Edwards, Debbie; Graham, Jasmine
Subject: FW: FOI #18-189 - RHVP Friction testing request
Importance: High
Sensitivity: Confidential

Hi Ladies:

See the attached for testing results on the RHVP. I have the last 2 years data. Can we discuss this today if possible.

Access to any reports, memos, drafts, correspondence about **friction testing** on the Red Hill Valley Parkway in the **last five years** AND any reports, memos (including drafts), or correspondence about **asphalt and/or pavement testing, assessments, plans** on the Red Hill Valley Parkway in the last **two years**

Regards
Gord McGuire O.L.S., B.Sc.
Director of Engineering Services
Public Works
905-546-2424 x2439

From: Cameron, Diana
Sent: November 8, 2018 10:39 AM
To: Moore, Gary <Gary.Moore@hamilton.ca>
Cc: McGuire, Gord <Gord.McGuire@hamilton.ca>
Subject: FW: FOI #18-189
Importance: High
Sensitivity: Confidential

Would you be able to point me in the right direction?

Please and thank you.

Diana Cameron
Administrative Assistant II
Engineering Services Division
City of Hamilton, Public Works
905-546-2424, Ext.4867

From: Wunderlich, Nancy
Sent: November-08-18 9:08 AM
To: Cameron, Diana
Cc: Watson, Anne; Rashford, Debbie-Ann
Subject: FW: FOI #18-189
Importance: High
Sensitivity: Confidential

Hi Diana,

Please refer to the attached inquiry for investigation and response. Please copy me on the feedback to Clerk's by the deadline noted.

Thanks,

Nancy Wunderlich, Administrative Coordinator to Dan McKinnon
General Manager, Public Works Department, City of Hamilton
320 - 77 James Street North Hamilton ON L8R 2K3
905.546.3641 (Telephone) | 905.546.4481 (Facsimile)
Nancy.Wunderlich@hamilton.ca

From: Watson, Anne
Sent: November-08-18 9:03 AM

To: Wunderlich, Nancy
Cc: Rashford, Debbie-Ann
Subject: FOI #18-189
Importance: High
Sensitivity: Confidential

Hello Nancy

Our office is in receipt of an application to access records pursuant to the provisions of MFIPPA; the details of the request are contained in the attached Information Sheet.

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Many thx Nancy and pls. contact me if you or staff have any questions.

Anne Watson
Access & Privacy Officer
Corporate Services
City of Hamilton
71 Main Street West, 1st Floor
HAMILTON ON L8P 4Y5
Phone (905) 546-2424 ext. 4632

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: November 12, 2018 10:52 AM
To: McGuire, Gord
Subject: RE: FOI #18-189 - RHVP Friction testing request - Meet with Legal Services

Sensitivity: Confidential

Yes

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: November-12-18 10:52 AM
To: MacNeil, Byrdena
Subject: Re: FOI #18-189 - RHVP Friction testing request - Meet with Legal Services
Sensitivity: Confidential

My schedule has changed. Are you available this afternoon after 3?

Gord McGuire O.L.S.
Director of Engineering Services
Public Works, City of Hamilton
905-546-2424 x2439

On Nov 12, 2018, at 10:40 AM, MacNeil, Byrdena <Byrdena.MacNeil@hamilton.ca> wrote:

> HI Gord,
>
> Yes, I can chat tomorrow, November 13th about this. Any time after 10:00 a.m.. Is there a time you prefer?
>
> **Byrdena M. MacNeil, Solicitor**
> City of Hamilton - Legal Services Division
> t: 905.546.2424, ext. 4637
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> Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9

Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: McGuire, Gord
Sent: November-11-18 7:23 PM
To: MacNeil, Byrdena
Subject: RE: FOI #18-189 - RHVP Friction testing request - Meet with Legal Services
Sensitivity: Confidential

Hi Byrdena:

Please see a series of attachments re: this file.

I have summarized the events as best as I can in the attachment labelled Red Hill Review GMc.

Please contact me about times to review.

Regards
Gord McGuire O.L.S., B.Sc.
Director of Engineering Services
Public Works
905-546-2424 x2439

From: MacNeil, Byrdena
Sent: November 9, 2018 3:04 PM
To: McGuire, Gord <Gord.McGuire@hamilton.ca>
Subject: FW: FOI #18-189 - RHVP Friction testing request
Importance: High
Sensitivity: Confidential

SOLICITOR-CLIENT PRIVILEGED

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Ron Sabo has asked me to assist you with the matter below. Do you have time to chat on Monday, November 12th? I am free any time after 10:30 a.m.

Thanks,
Byrdena

Byrdena M. MacNeil, Solicitor
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The contents of this e-mail transmission are privileged and confidential, intended only for the recipients named above and are subject to solicitor and client privilege. This message may not be copied, reproduced, retransmitted or used in any manner without the express written permission of the sender. If you have received this e-mail and are not the intended recipient, please destroy it and call 905.546.2424, ext. 4637, collect if long distance. Thank you.

From: McGuire, Gord
Sent: November-08-18 11:04 AM
To: Edwards, Debbie; Graham, Jasmine
Subject: FW: FOI #18-189 - RHVP Friction testing request
Importance: High
Sensitivity: Confidential

Hi Ladies:

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Access to any reports, memos, drafts, correspondence about **friction testing** on the Red Hill Valley Parkway in the **last five years** AND any reports, memos (including drafts), or correspondence about **asphalt and/or pavement testing, assessments, plans** on the Red Hill Valley Parkway in the last **two years**

Regards
Gord McGuire O.L.S., B.Sc.
Director of Engineering Services
Public Works
905-546-2424 x2439

From: Cameron, Diana
Sent: November 8, 2018 10:39 AM
To: Moore, Gary <Gary.Moore@hamilton.ca>
Cc: McGuire, Gord <Gord.McGuire@hamilton.ca>
Subject: FW: FOI #18-189
Importance: High
Sensitivity: Confidential

Would you be able to point me in the right direction?

Please and thank you.

Diana Cameron
Administrative Assistant II
Engineering Services Division
City of Hamilton, Public Works
905-546-2424, Ext.4867

From: Wunderlich, Nancy
Sent: November-08-18 9:08 AM
To: Cameron, Diana
Cc: Watson, Anne; Rashford, Debbie-Ann
Subject: FW: FOI #18-189
Importance: High
Sensitivity: Confidential

Hi Diana,

Please refer to the attached inquiry for investigation and response. Please copy me on the feedback to Clerk's by the deadline noted.

Thanks,

Nancy Wunderlich, Administrative Coordinator to Dan McKinnon
General Manager, Public Works Department, City of Hamilton
320 - 77 James Street North Hamilton ON L8R 2K3
905.546.3641 (Telephone) | 905.546.4481 (Facsimile)
Nancy Wunderlich@hamilton.ca

From: Watson, Anne
Sent: November-08-18 9:03 AM
To: Wunderlich, Nancy
Cc: Rashford, Debbie-Ann
Subject: FOI #18-189
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Sensitivity: Confidential

Hello Nancy

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Anne Watson
Access & Privacy Officer
Corporate Services

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From: MacNeil, Byrdena
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Public Works
905-546-2424 x2439

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Thanks,
Byrdena

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Subject: FW: FOI #18-189
Importance: High
Sensitivity: Confidential

Would you be able to point me in the right direction?

Please and thank you.

Diana Cameron
Administrative Assistant II
Engineering Services Division
City of Hamilton, Public Works
905-546-2424, Ext.4867

From: Wunderlich, Nancy
Sent: November-08-18 9:08 AM
To: Cameron, Diana
Cc: Watson, Anne; Rashford, Debbie-Ann
Subject: FW: FOI #18-189
Importance: High
Sensitivity: Confidential

Hi Diana,

Please refer to the attached inquiry for investigation and response. Please copy me on the feedback to Clerk's by the deadline noted.

Thanks,

Nancy Wunderlich, Administrative Coordinator to Dan McKinnon
General Manager, Public Works Department, City of Hamilton
320 - 77 James Street North Hamilton ON L8R 2K3
905.546.3641 (Telephone) | 905.546.4481 (Facsimile)
Nancy Wunderlich@hamilton.ca

From: Watson, Anne
Sent: November-08-18 9:03 AM

To: Wunderlich, Nancy
Cc: Rashford, Debbie-Ann
Subject: FOI #18-189
Importance: High
Sensitivity: Confidential

Hello Nancy

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Many thx Nancy and pls. contact me if you or staff have any questions.

Anne Watson
Access & Privacy Officer
Corporate Services
City of Hamilton
71 Main Street West, 1st Floor
HAMILTON ON L8P 4Y5
Phone (905) 546-2424 ext. 4632

MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: November 12, 2018 10:40 AM
To: Edwards, Debbie
Subject: RE: FOI #18-189 - RHVP Friction testing request

Sensitivity: Confidential

Hi Debbie – yes, whenever you are free today to chat, I can come up. I am free right now, if you are?

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Edwards, Debbie
Sent: November-11-18 3:43 PM
To: MacNeil, Byrdena
Subject: FW: FOI #18-189 - RHVP Friction testing request
Sensitivity: Confidential

Hi Byrdena. Given the email from Ron below, I am happy to have you reach out to Gord but want to make sure that you are aware of his sensitivity and context. Please let me know if you have a few minutes to chat on Monday (tomorrow)! Thanks Byrdena. Debbie

Hamilton
City of Hamilton
Legal and Risk Management
Services Division
City Hall
71 Main Street West
Hamilton, ON Canada L8P 4Y5
www.hamilton.ca

Deborah A. Edwards
Deputy City Solicitor, Commercial, Development and Policy
Legal and Risk Management Services Division, Corporate Services
City of Hamilton
Phone: 905.546.2424 ext. 2628
Fax: 905.546.4370
Physical Office: 50 Main St. East, 5th Floor, Hamilton, ON

From: Sabo, Ron
Sent: November-09-18 2:44 PM
To: Edwards, Debbie
Subject: RE: FOI #18-189 - RHVP Friction testing request
Sensitivity: Confidential

I've asked Byrdena to touch base with Gord. Ultimately the advice here if any would be for the FOI office as they are making the decision on the FOI response.

Hamilton
City of Hamilton
Legal and Risk Management Services
City Hall
71 Main Street West
Hamilton, ON Canada L8P 4Y5
www.hamilton.ca

R. A. Sabo
Deputy City Solicitor, Dispute Resolution
Legal and Risk Management Services, Corporate Services
City of Hamilton
Phone: 905.546.2424 ext. 3143
Fax: 905.546.4370
Physical Office: 50 Main St. East, 4th Floor, Hamilton, ON

From: Edwards, Debbie
Sent: 9-Nov-18 09:08
To: Sabo, Ron <Ron.Sabo@hamilton.ca>
Subject: FW: FOI #18-189 - RHVP Friction testing request
Importance: High
Sensitivity: Confidential

Ron, Gord McGuire has received this FOI request and is very anxious about it. He would appreciate some advice so I am hoping that you and I can discuss, perhaps on Monday? His deadline is the 15th and he is scheduled to be out of the country from the 15th to the 26th. Thanks Ron. Debbie

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Director of Engineering Services
Public Works
905-546-2424 x2439

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Would you be able to point me in the right direction?

Please and thank you.

Diana Cameron

Administrative Assistant II
Engineering Services Division
City of Hamilton, Public Works
905-546-2424, Ext.4867

From: Wunderlich, Nancy
Sent: November-08-18 9:08 AM
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Subject: FW: FOI #18-189
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MacNeil, Byrdena

From: MacNeil, Byrdena
Sent: November 9, 2018 3:04 PM
To: McGuire, Gord
Subject: FW: FOI #18-189 - RHVP Friction testing request
Attachments: 18-189 Info Sheet.docx

Importance: High
Sensitivity: Confidential

SOLICITOR-CLIENT PRIVILEGED

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905-546-2424 x2439

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Access & Privacy Officer
Corporate Services
City of Hamilton
71 Main Street West, 1st Floor
HAMILTON ON L8P 4Y5
Phone (905) 546-2424 ext. 4632

File #18-189

Request for Access to Municipal Records Information Sheet

Access and Privacy Officer: Anne Watson
Telephone: (905) 546-2424 ext. 4632
Fax: (905) 546-2095
E-mail: anne.watson@hamilton.ca

The City is in receipt of a request to access municipal records pursuant to the provisions of the *Municipal Freedom of Information and Protection of Privacy Act* (the *Act*).

Please review the request details below and complete the necessary searches for responsive records. Your department has seven (7) calendar days in which to complete its record searches and provide a response to our office.

If it appears that the **record searches** will exceed three (3) hours, you may wish to consider conducting a representative search of a smaller amount of records; providing our Office with a search time estimate detailed on page 2 of the Information Sheet. Based on your department's response our office will determine whether or not to issue a fee estimate to the requester before proceeding further with the request.

Your department response, including the completed Information Sheet and a **HARD COPY** of the responsive records, **SINGLE- SIDED AND UN-STAPLED** is due at our Office **(CITY HALL, 1ST FLR)** by **Thursday, November 15, 2018.**

Please contact **Anne Watson** if you have questions concerning the request or require assistance to complete page 2 of this form.

Access to any reports, memos, drafts, correspondence about **friction testing** on the Red Hill Valley Parkway in the **last five years** AND any reports, memos (including drafts), or correspondence about **asphalt and/or pavement testing, assessments, plans** on the Red Hill Valley Parkway in the last **two years**

Name: ______________________ **Division/Section:** __________________________

Phone: __________________

1. **Does your Department/division/section have records responsive to this request?** A record is defined as any record of information however recorded, whether in printed form, on film, by electronic means or otherwise. (e.g. reports, correspondence, memos, Inspector notebooks, books, plans, maps, drawings, diagrams, pictorial or graphic works, photographs, film, microfilm, sound recordings, e-mails)

   ☐ Yes ☐ No

2. Are any of the records that are responsive to this request, available to the Public directly through your Department? If yes, please **identify the record(s)**, any **applicable department fees**, and a **contact person and telephone number** (**DO NOT PROVIDE a copy of the records if the records are available directly through your office**).

   ☐ Yes ☐ No

   ____
   ____
   ____

3. If your Department has records responsive to the request that are **not** routinely available through your Department, please provide information describing the following:

   - The type of records;
   - Physical location of records and how the records are stored or maintained;
   - Approximate volume of responsive records;
   - The activities involved in identifying the responsive records
   - **List any concerns about disclosure of the records(s)**

   ____
   ____
   ____
   ____

4. Under the *Act* the City can apply fees for **record searching, record preparation, and photocopying ONLY**. However, for internal purposes the FOI Office does track the amount of time spent by City staff on each FOI request. Please indicate the amount of time spent completing **EACH** of the following activities (**if applicable**):

   - Searching for responsive records __________
   - Searching & Printing microfiche records __________
   - Searching & Printing AMANDA/HANSEN records __________
   - Pulling records __________
   - Reviewing records __________
   - Copying records __________
   - Assembling/scanning/delivering/faxing records __________

5. Are you aware of any other **City Department** (**e.g**. Public Works, Corporate Services, Healthy & Safe Communities) that may have responsive record(s)? If yes, please identify the Department and provide staff contact information if known.

   ☐ Yes ☐ No ______________________________________

   (If you are aware of **another** division or section **within** your **City Department** that may have responsive records, please ensure that the request details are appropriately disseminated and the response(s) included in your **Department's complete response**.)

MacNeil, Byrdena

From:	MacNeil, Byrdena
Sent:	November 9, 2018 3:02 PM
To:	Sabo, Ron
Subject:	RE: FOI #18-189 - RHVP Friction testing request
Sensitivity:	Confidential

Received. Will do.

Byrdena M. MacNeil, Solicitor
City of Hamilton - Legal Services Division
t: 905.546.2424, ext. 4637
f: 905.546.4370
e: byrdena.macneil@hamilton.ca
Courier Address: 50 Main Street East, 5th Floor, Hamilton, Ontario L8N 1E9
Mailing Address: City Hall, 71 Main Street West, Hamilton, Ontario L8P 4Y5

From: Sabo, Ron
Sent: November-09-18 2:42 PM
To: MacNeil, Byrdena
Subject: FW: FOI #18-189 - RHVP Friction testing request
Importance: High
Sensitivity: Confidential

As discussed, touch base with Gord, thanks

Hamilton
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Legal and Risk Management Services
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71 Main Street West
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www.hamilton.ca

R. A. Sabo
Deputy City Solicitor, Dispute Resolution
Legal and Risk Management Services, Corporate Services
City of Hamilton
Phone: 905.546.2424 ext. 3143
Fax: 905.546.4370
Physical Office: 50 Main St. East, 4th Floor, Hamilton, ON

From: Edwards, Debbie
Sent: 9-Nov-18 09:08
To: Sabo, Ron <Ron.Sabo@hamilton.ca>
Subject: FW: FOI #18-189 - RHVP Friction testing request
Importance: High
Sensitivity: Confidential

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Regards

Gord McGuire O.L.S., B.Sc.
Director of Engineering Services
Public Works
905-546-2424 x2439

From: Cameron, Diana
Sent: November 8, 2018 10:39 AM
To: Moore, Gary <Gary.Moore@hamilton.ca>
Cc: McGuire, Gord <Gord.McGuire@hamilton.ca>
Subject: FW: FOI #18-189
Importance: High
Sensitivity: Confidential

Would you be able to point me in the right direction?

Please and thank you.

Diana Cameron
Administrative Assistant II
Engineering Services Division
City of Hamilton, Public Works
905-546-2424, Ext.4867

From: Wunderlich, Nancy
Sent: November-08-18 9:08 AM
To: Cameron, Diana
Cc: Watson, Anne; Rashford, Debbie-Ann
Subject: FW: FOI #18-189
Importance: High
Sensitivity: Confidential

Hi Diana,

Please refer to the attached inquiry for investigation and response. Please copy me on the feedback to Clerk's by the deadline noted.

Thanks,

Nancy Wunderlich, Administrative Coordinator to Dan McKinnon
General Manager, Public Works Department, City of Hamilton
320 - 77 James Street North Hamilton ON L8R 2K3
905.546.3641 (Telephone) | 905.546.4481 (Facsimile)
Nancy Wunderlich@hamilton.ca

From: Watson, Anne
Sent: November-08-18 9:03 AM
To: Wunderlich, Nancy

Cc: Rashford, Debbie-Ann
Subject: FOI #18-189
Importance: High
Sensitivity: Confidential

Hello Nancy

Our office is in receipt of an application to access records pursuant to the provisions of MFIPPA; the details of the request are contained in the attached Information Sheet.

Nancy, please review the request details and forward to the appropriate dept. contact(s), confirming same with our office. Also Nancy, would you pls. ensure that page 2 of the Information Sheet is completed and returned to our office with the department's complete response by the due date **November 15, 2018**?

Many thx Nancy and pls. contact me if you or staff have any questions.

Anne Watson
Access & Privacy Officer
Corporate Services
City of Hamilton
71 Main Street West, 1st Floor
HAMILTON ON L8P 4Y5
Phone (905) 546-2424 ext. 4632

Lenczner Slaght

130 Adelaide St W
Suite 2600
Toronto, ON
Canada M5H 3P5

T 416-865-9500
F 416-865-9010
www.litigate.com

April 5, 2019

Eli S. Lederman
Direct line: 416-865-3555
Direct fax: 416-865-2872
Email: elederman@litigate.com

Via Email

The Honourable Chief Justice Heather J. Forster Smith
Chief Justice of the Superior Court of Justice
130 Queen Street West
Toronto, ON
M5H 2N5

Dear Chief Justice Smith:

RE: Corporation of the City of Hamilton – Request to Appoint a Judicial Inquiry

We are writing to you in our capacity as counsel to the Corporation of the City of Hamilton.

At a meeting held on March 20, 2019, Council of the City of Hamilton passed a resolution requesting a judge of the Superior Court of Justice to investigate matters relating to a failure to disclose to the City Council a draft report prepared by Tradewind Scientific Ltd., dated November 20, 2013 with respect to the friction levels on the Red Hill Valley Parkway in the City of Hamilton.

You will find enclosed a true certified copy of the Motion requesting that a judge be appointed pursuant to section 274 of the *Municipal Act, 2001,* S.O. 2001, c.25 to conduct an investigation.

We would be grateful to be advised when a judge has been appointed pursuant to the terms of the Motion.

Please also copy any future correspondence to Ms. Nicole Auty, City Solicitor for the City of Hamilton. She may be reached at:

The City of Hamilton
71 Main Street West
Hamilton, Ontario, L8P 4Y5
Tel: 905-546-2424 ext. 4636
Fax: 905-546-4370
Email: Nicole.Auty@hamilton.ca

We look forward to hearing from you.

Yours very truly,

Eli S. Lederman

EL/DC/mw
Enclosure.

c. Nicole Auty, *City Solicitor for the City of Hamilton*
Mike Zegarac, *Interim City Manager for the City of Hamilton*
Delna Contractor, *Lenczner Slaght LLP*

City of Hamilton
71 Main Street West
Hamilton, ON L8P 4Y5
www.hamilton.ca

Hamilton

4.2 Judicial Investigation respecting the Lincoln Alexander & Red Hill Valley Parkways

(a) That the City's outside legal counsel, in consultation with the Acting City Manager, be directed to prepare the necessary documents to file an application before the Superior Court to initiate a Judicial Investigation, pursuant to *Ontario Municipal Act*, 2001, as amended, Section 274.1.a & b, (Investigation by a Judge), and the *Public Inquires Act*, Section 33, (Public Inquiries); and,

(b) That the scope of the Judicial Investigation could include, but not be limited to, the following questions and be referred to outside legal counsel for review and a report back to the General Issues Committee:

(i) Who received, was briefed or was advised on the existence of the November 20th, 2013 Tradewind Scientific Friction Testing Survey Summary Report on the Lincoln Alexander & Red Hill Valley Parkways (the document) in 2013 or subsequent years;

(ii) Who was the individual or individuals, who decided not to disclose the document in 2013;

(iii) What was the rationale for not disclosing the document in 2013;

(iv) Who received a copy, was briefed or was informed about the existence of the document in 2018;

(v) What was the rationale for not disclosing the document in September 2018;

(vi) Did the document provide sufficient cause to make safety changes to the roads, or provide cause for further study;

(vii) What role, if any, did the non-disclosure of the document play in the increase in accidents, injuries or fatalities on the roads;

(viii) Did anyone in the Public Works Office or Roads Department request, direct or conduct any other friction test, asphalt assessment, or general road safety reviews or assessments on the roads;

(ix) Did subsequent consultant reports provide additional support or rebuttal to the document's conclusions;

(x) Did the Ministry of Transportation's (MTO) recently revealed friction tests provide additional support or rebuttals to the document's conclusions;

(xi) What was the rationale for the Ministry of Transportation to not disclose their findings from the city and the public;

(xii) Who was briefed within the Ministry or the Minister's Office about the findings of the MTO's friction tests;

(xiii) Did the MTO friction test provide sufficient cause to make safety changes to the roads, or provide cause for further study;

(xiv) What role, if any, did the non-disclosure of the MTO friction tests play in the increase in accidents, injuries or fatalities on the roads;

(xv) Did the MTO conduct any other road assessment, friction tests, or general safety reviews or assessments on the roads;

(xvi) Was there any malfeasance, wrong doing or misconduct by any person or persons in relations to their role in the non-disclosure of the document;

(xvii) Review and make recommendations to improve City policy and procedures to prevent such future incidents;

(xviii) What is the standard in Ontario for friction;

(xix) Are results for friction for highways across the Province available; and

(xx) Is speed, traffic weaving and lighting as big an issue as the friction tests.

I hereby certify the foregoing to be a true copy of Motion 4.2 of the Minutes of City of Hamilton Council of March 20, 2019.

Dated at the City of Hamilton on this 3rd day of April, 2019.

J. Pilon
Acting City Clerk

This is **Exhibit "D"** referred to in
the Affidavit of **Byrdena MacNeil**
sworn this 15th day of March, 2023

Olivia Eng

A Commissioner for Taking Affidavits

Court File No.: 17-61728

ONTARIO
SUPERIOR COURT OF JUSTICE

B E T W E E N:

SHANNON HANSEN and HEATHER HANSEN

Plaintiffs

- and -

MARK BERNAT and CITY OF HAMILTON

Defendants

VOLUME I
AFFIDAVIT OF DOCUMENTS

I, Marco Oddi, of the City of Hamilton, in the Province of Ontario, MAKE OATH AND SAY:

1. I am a Manager in the Engineering Services Division of the Public Works Department for the Defendant, City of Hamilton, which is a corporation.

2. I have conducted a diligent search of the corporation's records and made appropriate enquiries of others to inform myself in order to make this Affidavit. This Affidavit discloses, to the full extent of my knowledge, information and belief, all documents relevant to any matter in issue in this action that are or have been in the possession, control or power of the corporation.

3. I have listed in Schedule A those documents that are in the possession, control or power of the corporation and that it does not object to producing for inspection.

4. I have listed in Schedule B those documents that are or were in the possession, control or power of the corporation and that it objects to producing because it claims they are privileged, and I have stated in Schedule B the grounds for each such claim.

5. I have listed in Schedule C those documents that were formerly in the possession, control or power of the corporation but are no longer in its

possession, control or power and I have stated in Schedule C when and how it lost possession or control of or power over them and their present location.

6. The corporation has never had in its possession, control or power any documents relevant to any matter in issue in this action other than those listed in Schedules A, B, and C.

SWORN BEFORE ME at the City of Hamilton, in the Province of Ontario, this 3rd day of May, 2018)	
A Commissioner, etc.	**MARCO ODDI**

LAWYER'S CERTIFICATE

I CERTIFY that I have explained to the deponent,

(a) the necessity of making full disclosure of all documents relevant to any matter in issue in the action; and,

(b) what kinds of documents are likely to be relevant to the allegations made in the pleadings.

Dated: May 3/18

DANA-ELISABETA LEZAU

SCHEDULE "A"

Documents in the corporation's possession, control or power that it does not object to producing for inspection.

PLEADINGS

All pleadings and proceedings relating to Court File No. 17-61728.

CORRESPONDENCE

No.	Date	Document	Sender	Recipient	No. of Pages
1.	December 18, 2015	Notice Letter	Nolan Glenn, Nolan Paralegals	City of Hamilton	2
2.	December 23, 2015	Correspondence	Adam Tollis, Cunningham Lindsey	Nolan Glenn, Nolan Paralegals	3
3.	February 25, 2016	Correspondence	Adam Tollis, Cunningham Lindsey	Nolan Glenn, Nolan Paralegals	1
4.	April 8, 2016	Correspondence	Adam Tollis, Cunningham Lindsey	Nolan Glenn, Nolan Paralegals	1

INVESTIGATION

No.	Date	Document	Sender/Creator	Recipient	No. of Pages
5.	October 1, 2013 – October 31 2015	Hansen Search, Red Hill Valley Parkway	Public Works, City of Hamilton		90
6.	October 2013	Red Hill Valley Parkway Safety Review	CIMA		114
7.	October 24, 2015	Amec Weather Forecast – Hamilton North Zone	Public Works, City of Hamilton		4
8.	October 24, 2015	Daily and Monthly Environment Canada Weather Records	Environment Canada		5
9.	October 24, 2015	Hamilton Police Service	Hamilton Police		28

		Records including Motor Vehicle Accident Report #15-739738, duty notes and 911 call on disc	Service		
10.	October 24, 2015	Hansen Printout re MVA # 15-739738	Public Works, City of Hamilton		1
11.	November 2015	Red Hill Valley Parkway Detailed Safety Analysis	CIMA		88
12.	April 4, 2016	Hamilton Strategic Road Safety Program Update	Public Works, City of Hamilton	Public Works Committee	18
13.	May 11, 2016	Information Update	Public Works, City of Hamilton	Mayor and City Council	3
14.	May 20, 2016	Information Update	Public Works, City of Hamilton	Mayor and City Council	4
15.	September 19, 2016	Information Report	Public Works, City of Hamilton	Public Works Committee	2
16.	October 3, 2016	Information Report	Public Works, City of Hamilton	Public Works Committee	4
17.	January 16, 2017	Information Report	Public Works, City of Hamilton	Public Works Committee	1
18.	March 24, 2017	Information Update	Public Works, City of Hamilton	Mayor and City Council	3
19.	April 13, 2017	Report - Five Year Statistical Analysis of Fatal Collisions in Hamilton	Hamilton Police Services Board		23
20.	May 19, 2017	Information Update	Public Works, City of Hamilton	Mayor and City Council	5
21.	April 20, 2018	26 Colour Photographs of accident location	Cunningham Lindsey		26

[redacted]

OFFICE OF THE CITY CLERK

DEC 18 2015

REF'D TO J. McLennan

REF'D TO ____________

REF'D TO ____________

ACTION ____________

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

http://siriusapp/han8prod/ — Lookup Ser

File Edit View Favorites Tools Help

Infor Public Sector v8.5.0

Asset Management ▾ Inventory ▾ Work Management ▾ Customer Service ▾ Resources ▾ System

My Infor | Lookup Service Requests (CSLSR)

Action | Show | ?

Search Criteria | Results (87 records) | Map

Service Request #: | Priority: | Inspector:

Request Type: TRACC | Responsibility: | Resolution:

Area: | Map #:

Sub-area: | Taken By:

Reference #: | Caller First:

Identification code for the sub-area within the area in which a service request is located, such as a district within a county.

	Number	Pre Dir	Street Name	Suffix	Post Dir	Subdesignation
Ad			RED HILL VALLEY	PKY		
Cross Street\P						

City, Province, Postal Code: HAMILTON | ON |

Asset:

Parcel ID:

Property ID:

Request Status:

Assigned: Both

		From		To	
Scheduled	Both	/ /	:	/ /	:
Started	Both	/ /	:	/ /	:
Completed	Both	/ /	:	/ /	:
Resolved	Both	/ /	:	/ /	:
Inspection Due By	Both	/ /	:	/ /	:
Requested Date	Both	/ /	:	/ /	:
Call Date	Both	01/10/2013	00:01	31/10/2015	23:59

☐ St

Log Type

http://siriusapp/han8prod/ Lookup Ser

File Edit View Favorites Tools Help

Infor Public Sector v8.5.0

Asset Management Inventory Work Management Customer Service Resources System

My Infor Lookup Service Requests (CSLSR)

Action Show ?

Search Criteria Results (87 records) Map

Service	Request Type	Request Date	Resolved	Reference #	Priority	Responsibility	Insp
13376453	TRACC	28/10/2015 22:5	11/11/2015 02			TRAN	121
13369629	TRACC	25/10/2015 02:5	11/11/2015 02			TRAN	121
13369565	TRACC	24/10/2015 18:1	24/10/2015 21			TRAA	013
13369554	TRACC	24/10/2015 17:0	24/10/2015 21			TRAA	013
13363127	TRACC	20/10/2015 23:4	21/10/2015 03			TRAN	121
13355077	TRACC	16/10/2015 01:1	17/03/2017 14			TRAN	056
13345588	TRACC	09/10/2015 08:1	24/02/2017 16		EMRG	TRAD	105
13336571	TRACC	04/10/2015 09:5	09/02/2017 12			TRND	
13336472	TRACC	03/10/2015 17:0	03/10/2015 22			TRAA	013
13329834	TRACC	29/09/2015 22:4	30/09/2015 01			TRAN	056
13311612	TRACC	19/09/2015 16:1	19/09/2015 17			TRAA	013
13304961	TRACC	16/09/2015 08:1	09/02/2017 11		EMRG	TRND	105
13299588	TRACC	13/09/2015 09:2	13/09/2015 22			TRAD	083
13299214	TRACC	12/09/2015 00:4	17/03/2017 15		EMRG	TRAN	056
13286067	TRACC	03/09/2015 17:3	04/09/2015 22		EMRG	TRAA	013
13264029	TRACC	22/08/2015 13:1	22/08/2015 18			TRAD	083
13232591	TRACC	04/08/2015 17:1	04/08/2015 10			TRAA	083
13229617	TRACC	03/08/2015 07:3	03/08/2015 11		EMRG	TRAD	021
13213732	TRACC	24/07/2015 04:3	26/07/2015 05			TRAN	121
13187948	TRACC	10/07/2015 08:0	17/03/2017 15			TRAD	
13182886	TRACC	07/07/2015 19:3	07/07/2015 13			TRAA	083
13165073	TRACC	28/06/2015 14:4	28/06/2015 18			TRAD	083

Enter Values

Leave default null for all Addresses or Enter an address (Street # and Street Name)

red hill valley

Enter a Request Type (leave as * for any Request Type or use * for wildcard searches):

TRACC

>

Selected Values:

TRACC

Remove | Remove All

Enter Request Date:

Start of Range:

Enter a Value:

10/1/2013 00:00:00

☑ Include this value ☐ No lower value

End of Range:

Enter a Value:

10/31/2015 23:59:59

☑ Include this value ☐ No upper value

Service Request Resolved (Y, N, N/A):

N/A - Both

Enter a Value:

N/A

Enter a Responsibility Code (leave as * for any Responsibility Code or use * for wildcard searches):

*

>

Selected Values:

*

Remove | Remove All

From: Filice, Antonio
Sent: September-19-17 12:01 PM
To: Fraser, Kurt
Subject: Multiple Hansen search request (RMS # 047021)

Hamilton

Service Request Information (Hansen)

3400031

SR #	**3400031**	**Area**	WARD4
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	05/10/2013 10:39	**District**	
Taken By	118788-0	**Map #**	
Incident Date	05/10/2013 10:39	**Reference #**	
Priority	-	**Source**	
Responsibility	TRAD - ROADS AFTER HOURS DAYS	Last Modified By	cspiak
Project	-	Last Modified Date Time	17/03/2017 11:53:37
Address	RED HILL VALLEY PKY / QUEENSTON RD HAMILTON	Reviewed By	
Location		Reviewed Date	
Additional Information			

Inspection

Inspector	013956-0			Severity	1
Scheduled	05/10/2013 10:39	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	17/03/2017 11:53	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone

EMAIL

Call Date: 05/10/2013 10:39 am **Taken By:** 118788-0

Customer Comments MVA fluid cleanup, event#721785

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 11:53:37AM	AGENCY06	Assumed complete - cspiak

Hamilton

Service Request Information (Hansen)

3410635

SR # 3410635

Request Type TRACC - Roads - Accidents/Claims
Request Date 13/10/2013 18:04
Taken By 115417-0
Incident Date 13/10/2013 18:04
Priority
Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS
Project
Address RED HILL VALLEY PKY / BARTON ST E HAMILTON
Location NORTH BOUND
Additional Information CALL SPILL

Area WARD4-5
Sub-area
District
Map #
Reference #
Source
Last Modified By SCAPOSTAGNO
Last Modified Date Time 14/10/2013 22:22:48
Reviewed By
Reviewed Date

Inspection

Inspector 013956-0 Severity 1
Scheduled 13/10/2013 18:04 **Due By**
Started **Due By**
Completed **Due By**
Resolved 14/10/2013 22:22 **Due By**
Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 13/10/2013 06:04 pm **Taken By:** 115417-0

Customer Comments fluid clean up from mvc - incident #728 364

Logs

Hamilton

Service Request Information (Hansen)

3417479

SR # 3417479

Request Type TRACC - Roads - Accidents/Claims

Request Date 17/10/2013 21:03

Taken By 112920-0

Incident Date 17/10/2013 21:03

Priority

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project

Address RED HILL VALLEY PKY HAMILTON

Location

Additional Information CALL IN SPILL

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By SCAPOSTAGNO

Last Modified Date Time 17/10/2013 21:27:54

Reviewed By

Reviewed Date

Inspection

Inspector 013956-0

Severity 1

Scheduled | **Due By**

Started | **Due By**

Completed | **Due By**

Resolved 17/10/2013 21:27 | **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller

Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			

EMAIL

Call Date: 17/10/2013 09:03 pm **Taken By:** 112920-0

Customer Comments N/B near King St exit. Fluid and guard rail damage. Inc #P13-731475

Logs

Hamilton

Service Request Information (Hansen)

3419846

SR # 3419846

Request Type TRACC - Roads - Accidents/Claims

Request Date 19/10/2013 13:29

Taken By 117839-0

Incident Date 19/10/2013 13:29

Priority

Responsibility TRAD - ROADS AFTER HOURS DAYS

Project

Address RED HILL VALLEY PKY HAMILTON

Location SOUTHBOUND LANES UNDER THE KING STREET OVERPASS

Additional Information Quantum has been called and clean-up has taken place on Ocotber 19 / 2013.Paper work done by B. Boudreau.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By RSPAGNUOLO

Last Modified Date Time 19/10/2013 17:24:45

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled	19/10/2013 13:29	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	19/10/2013 17:24	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 19/10/2013 01:29 pm **Taken By:** 117839-0

Customer Comments Incident #P13-732699 - fluid clean up from mvc

Logs

Service Request Information (Hansen)

Hamilton

3430164

SR # **3430164**

Request Type	TRACC - Roads - Accidents/Claims	Area	WARD4-5
Request Date	25/10/2013 17:01	Sub-area	
Taken By	112920-0	District	
Incident Date	25/10/2013 18:06	Map #	
Priority		Reference #	
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Source	
Project		Last Modified By	RSPAGNUOLO
Address	RED HILL VALLEY PKY HAMILTON	Last Modified Date Time	26/10/2013 8:06:18
Location		Reviewed By	
		Reviewed Date	

Additional Information *Quantum has been called and clean-up has taken place on October 25 / 2013. Paper work done by J. Corsini.*

Inspection

Inspector 083540-0 — Severity 1

Scheduled		Due By	
Started		Due By	
Completed		Due By	
Resolved	26/10/2013 08:06	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller — Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			

EMAIL

Call Date: 25/10/2013 05:01 pm **Taken By:** 112920-0

Customer Comments fluid - S/B between Barton and Queenston...Inc #P13-737176

Logs

Hamilton

Service Request Information (Hansen)

3430754

SR # 3430754

Request Type TRACC - Roads - Accidents/Claims

Request Date 27/10/2013 12:45

Taken By 107516-1

Incident Date 27/10/2013 12:45

Priority EMRG - Emergency

Responsibility TRAD - ROADS AFTER HOURS DAYS

Project

Address RED HILL VALLEY PKY / BARTON ST E HAMILTON

Location

Additional Information referred to Sam Capostagno due to shift change and paper work done by Dave Thomas on October 27 / 2013.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By RSPAGNUOLO

Last Modified Date Time 28/10/2013 15:53:06

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled	27/10/2013 12:49	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	28/10/2013 15:52	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 27/10/2013 12:45 pm **Taken By:** 107516-1

Customer Comments MVA - oil clean up on ramp from barton going onto south bound lanes - INCEIDENT P 13 738 566

Logs

Hamilton

Service Request Information (Hansen)

3438350

SR # 3438350

Request Type TRACC - Roads - Accidents/Claims

Request Date 01/11/2013 08:30

Taken By 119206-0

Incident Date 31/10/2013 21:52

Priority

Responsibility TRND - ROADS NORTH

Project

Address RED HILL VALLEY PKY HAMILTON

Location -GUARD RAIL NEEDS TO BE LOOKED AT-
NORTH BOUND, JUST SOUTH OF KING STREET EXIT, MEDIAN SIDE/ LEFT HAND SIDE

Additional Information hold for business hours

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By KMARK

Last Modified Date Time 27/11/2013 11:17:30

Reviewed By

Reviewed Date

Inspection

Inspector

Severity 1

Scheduled		**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	27/11/2013 11:17	**Due By**	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE DISPATCH			
		EMAIL	

Call Date: 31/10/2013 09:52 pm **Taken By:** 119206-0

Customer Comments Hamilton Police called in regards to an accident - car spun out and hit guard rail on redhill valley -north bound- just south of king on the left hand median side. HAMILTON POLICE SAID ITS NOT URGENT - but guard rail will need to be inspectedincident #741969

Logs

Hamilton

Service Request Information (Hansen)

3440599

SR #	**3440599**	**Area**	WARD4
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	02/11/2013 17:50	**District**	
Taken By	120049-0	**Map #**	
Incident Date	02/11/2013 17:50	**Reference #**	
Priority		**Source**	
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Last Modified By	SCAPOSTAGNO
Project		Last Modified Date Time	02/11/2013 21:52:10
		Reviewed By	
		Reviewed Date	

Address RED HILL VALLEY PKY / QUEENSTON RD HAMILTON

Location SOUTH BOUND

Additional Information P13- 743 466fluid clean up mva / CALL IN SPILL

Inspection

Inspector 013956-0 Severity 1

Scheduled	02/11/2013 17:50	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	02/11/2013 21:52	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 02/11/2013 05:50 pm **Taken By:** 120049-0

Customer Comments

Logs

Service Request Information (Hansen)

Hamilton

3443252

SR # 3443252

Request Type TRACC - Roads - Accidents/Claims
Request Date 04/11/2013 17:46
Taken By 117839-0
Incident Date 04/11/2013 17:46
Priority
Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS
Project
Address RED HILL VALLEY PKY HAMILTON
Location EXIT TO MUD ON THE RAMP
Additional Information Quantum has been called and clean-up has taken place on November 04 / 2013 , Paper work done by Dave Thomas

Area WARD4-5
Sub-area
District
Map #
Reference #
Source
Last Modified By RSPAGNUOLO
Last Modified Date Time 04/11/2013 20:29:37
Reviewed By
Reviewed Date

Inspection

Inspector 083540-0 Severity 1
Scheduled 04/11/2013 17:46 **Due By**
Started **Due By**
Completed **Due By**
Resolved 04/11/2013 20:29 **Due By**
Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON FIRE			
		EMAIL	

Call Date: 04/11/2013 05:46 pm **Taken By:** 117839-0

Customer Comments Incident F13-032866 - mvc - request absorbent clean up

Logs

Hamilton

Service Request Information (Hansen)

3466176

SR # 3466176

Request Type	TRACC - Roads - Accidents/Claims	Area	WARD4-5
Request Date	20/11/2013 16:56	Sub-area	
Taken By	107516-1	District	
Incident Date	20/11/2013 16:56	Map #	
Priority	EMRG - Emergency	Reference #	
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Source	
Project		Last Modified By	RSPAGNUOLO
Address	RED HILL VALLEY PKY HAMILTON	Last Modified Date Time	20/11/2013 17:46:31
Location	SB AT BARTON STREET EXIT	Reviewed By	
Additional Information	Boulders has been removed on November 20 / 2013 by Dave Thomas	Reviewed Date	

Inspection

Inspector	083540-0			Severity	1
Scheduled	20/11/2013 16:56	Due By			
Started		Due By			
Completed		Due By			
Resolved	20/11/2013 17:46	Due By			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller — Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
		EMAIL	

Call Date: 20/11/2013 04:56 pm — Taken By: 107516-1

Customer Comments: boulders on road - Incident # P 13 756 613

Logs

Service Request Information (Hansen)

Hamilton

3468635

SR # **3468635**

Request Type TRACC - Roads - Accidents/Claims

Request Date 22/11/2013 11:32

Taken By 000846-0

Incident Date 22/11/2013 11:32

Priority

Responsibility TRED - ROADS EAST

Project

Address RED HILL VALLEY PKY HAMILTON

Location @ MUD ST EXIT - TRAVELLING SOUTH BOUND

Additional Information Fwded to Supervisor T. Pilszak - dispatched Acting Investigator D. Crevatin who will assess site.District North responded to site as per J. Manning.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By PEYRE

Last Modified Date Time 22/11/2013 12:57:35

Reviewed By

Reviewed Date

Inspection

Inspector

Severity 1

Scheduled		**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	22/11/2013 11:32	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
CONTACT CENTRE FOR HAMILTON POLICE			

EMAIL

Call Date: 22/11/2013 11:32 am **Taken By:** 000846-0

Customer Comments Contact Centre reports for Hamilton Police rock and gravel debris at this location. Incident P13-757-861, Badge #74. Please inspect re: removal.

Logs

Hamilton

Service Request Information (Hansen)

3479813

SR # 3479813

Request Type TRACC - Roads - Accidents/Claims
Request Date 02/12/2013 07:41
Taken By 113451-0
Incident Date 02/12/2013 07:41
Priority
Responsibility TRND - ROADS NORTH
Project
Address RED HILL VALLEY PKY HAMILTON
Location N/B ON EXIT RAMP TO GREENHILL
Additional Information OCT 23/14 - CLOSED; WOULD HAVE BEEN COMPLETED SAME DAY AS REPORTED

Area WARD4-5
Sub-area
District
Map #
Reference #
Source
Last Modified By KMARK
Last Modified Date Time 23/10/2014 11:41:22
Reviewed By
Reviewed Date

Inspection

Inspector 105099-0 Severity 1
Scheduled **Due By**
Started **Due By**
Completed **Due By**
Resolved 23/10/2014 11:41 **Due By**
Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 02/12/2013 07:41 am **Taken By:** 113451-0

Customer Comments Fluid cleanup from MVC. Inc# P13-764799

Logs

Hamilton

Service Request Information (Hansen)

3500308

SR # 3500308

Request Type TRACC - Roads - Accidents/Claims

Request Date 17/12/2013 00:39

Taken By 115418-0

Incident Date 17/12/2013 00:39

Priority

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project

Address RED HILL VALLEY PKY HAMILTON

Location REDHILL NORTHBOUND JUST NORTH OF GREENHILL, MIDDLE MEDIAN

Additional Information WAS RELAYED TO M. MCENTEE FOR INVESTIGATION, HAS BEEN RESOLVED.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By JDURANT

Last Modified Date Time 05/01/2014 13:51:17

Reviewed By

Reviewed Date

Inspection

Inspector 023545-0

Severity 1

Scheduled 17/12/2013 00:39 **Due By**

Started **Due By**

Completed **Due By**

Resolved 05/01/2014 13:51 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE		(905)546-4925 x	
		EMAIL	

Call Date: 17/12/2013 12:39 am **Taken By:** 115418-0

Customer Comments Police report median has been struck and damaged after an MVAPolice Incedent #P13-775427

Logs

Hamilton

Service Request Information (Hansen)

3515876

SR # 3515876

Request Type TRACC - Roads - Accidents/Claims

Request Date 29/12/2013 03:03

Taken By 118787-0

Incident Date 29/12/2013 03:03

Priority

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project

Address RED HILL VALLEY PKY HAMILTON

Location POLICE MVA INCIDENT 784124 FLUID AND A LITTLE DEBRIS NORTH BOUND FROM STONE CHURCH EXIT.

Additional Information Police cancelled call before we got up there.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By MMCENTEE

Last Modified Date Time 29/12/2013 22:36:26

Reviewed By

Reviewed Date

Inspection

Inspector 056380-0

Severity 1

Scheduled 29/12/2013 03:07 **Due By**

Started **Due By**

Completed **Due By**

Resolved 29/12/2013 22:36 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			

EMAIL

Call Date: 29/12/2013 03:03 am **Taken By:** 118787-0

Customer Comments MVA INCIDENT 784124 FLUID AND DEBRIS NORTH BOUND FROM STONE CHURCH EXIT.

Logs

Hamilton

Service Request Information (Hansen)

3524090

SR # 3524090

Request Type TRACC - Roads - Accidents/Claims
Request Date 03/01/2014 19:07
Taken By 120322-0
Incident Date 03/01/2014 19:07
Priority EMRG - Emergency
Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS
Project
Address RED HILL VALLEY PKY HAMILTON
Location UNDERNEATH THE KING STREET OVERPASS - SOUTH BOUND LANE
Additional Information CALL IN SPILL

Area WARD4-5
Sub-area
District
Map #
Reference #
Source
Last Modified By SCAPOSTAGNO
Last Modified Date Time 03/01/2014 22:42:38
Reviewed By
Reviewed Date

Inspection

Inspector 013956-0
Severity 1

Scheduled	03/01/2014 19:10	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	03/01/2014 22:42	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			

EMAIL

Call Date: 03/01/2014 07:07 pm **Taken By:** 120322-0

Customer Comments Fluid Cleanup and sander required - very slipperyaccident called in by the policeIncident #501518Police called back in and indicated that the guard rail is damaged

Logs

HAM0064439_0001
RHV0001045

Hamilton

Service Request Information (Hansen)

3551774

SR # 3551774

Area WARD4-5
Sub-area
District
Map #
Reference #
Source

Request Type TRACC - Roads - Accidents/Claims
Request Date 18/01/2014 13:05
Taken By 120049-0
Incident Date 18/01/2014 13:05
Priority
Responsibility TRAD - ROADS AFTER HOURS DAYS
Project

Last Modified By RSPAGNUOLO
Last Modified Date Time 20/01/2014 15:37:56
Reviewed By
Reviewed Date

Address RED HILL VALLEY PKY HAMILTON
Location NORTH BOUND, NORTH OF STONE CHURCH CUT OFF
Additional Information incident number- 521 949..........Pictures has been taken and send to Paul McShane for a permanente fix on January 19 / 2014.

Inspection

Inspector 083540-0 Severity 1
Scheduled 18/01/2014 13:05 **Due By**
Started **Due By**
Completed **Due By**
Resolved 20/01/2014 15:37 **Due By**
Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 18/01/2014 01:05 pm **Taken By:** 120049-0

Customer Comments mva fluid clean up as well as a damaged guard rail. North bound, north of stone church road

Logs

Hamilton

Service Request Information (Hansen)

3560478

SR # 3560478

Request Type TRACC - Roads - Accidents/Claims

Request Date 23/01/2014 14:22

Taken By 113451-0

Incident Date 23/01/2014 14:22

Priority -

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location N/B, NORTH OF GREENHILL

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By cspiak

Last Modified Date Time 17/03/2017 12:03:26

Reviewed By

Reviewed Date

Inspection

Inspector 105099-0

Severity 1

Scheduled		**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	17/03/2017 12:03	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 23/01/2014 02:22 pm **Taken By:** 113451-0

Customer Comments Fluid cleanup from MVC. Inc# P14-516248

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 12:03:26PM	AGENCY06	Assumed complete - cspiak

Hamilton

Service Request Information (Hansen)

3569063

SR #	**3569063**	Area	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	Sub-area	
Request Date	28/01/2014 17:52	District	
Taken By	120318-0	Map #	
Incident Date	28/01/2014 17:52	Reference #	
Priority	EMRG - Emergency	Source	
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Last Modified By	RSPAGNUOLO
Project		Last Modified Date Time	01/02/2014 8:23:00
Address	RED HILL VALLEY PKY HAMILTON	Reviewed By	
Location	NORTHBOUND - HALFWAY BETWEEN MUD AND GREENHILL	Reviewed Date	
Additional Information	Police PO#14-520125...Quantum has been called and clean-up has taken place on January 28 / 2014 . Paper work done by Dave Thomas.		

Inspection

Inspector	083540-0			Severity	1
Scheduled	28/01/2014 17:51	Due By			
Started		Due By			
Completed		Due By			
Resolved	01/02/2014 08:22	Due By			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
FIRE DISPATCH		( ) - x3355	
		EMAIL	

Call Date: 28/01/2014 05:52 pm Taken By: 120318-0

Customer Comments Fire has laid absorbent at an MVA. Incident #F14003573. **Police PO #14-520125

Logs

Hamilton

Service Request Information (Hansen)

3569076

SR # 3569076

Request Type TRACC - Roads - Accidents/Claims
Request Date 28/01/2014 19:07
Taken By 120318-0
Incident Date 28/01/2014 19:07
Priority EMRG - Emergency
Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS
Project
Address RED HILL VALLEY PKY HAMILTON
Location NBOUND LANE WHERE YOU MERGE ONTO THE HIGHWAY FROM MUD
Additional Information Quantum has been called and clean-up has taken place on January 28 / 2014.Paper work done by Dave Thomas.

Area WARD4-5
Sub-area
District
Map #
Reference #
Source
Last Modified By RSPAGNUOLO
Last Modified Date Time 01/02/2014 8:23:52
Reviewed By
Reviewed Date

Inspection

Inspector 083540-0
Severity 1
Scheduled 28/01/2014 19:07 **Due By**
Started **Due By**
Completed **Due By**
Resolved 01/02/2014 08:23 **Due By**
Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE DISPATCH			

EMAIL

Call Date: 28/01/2014 07:07 pm **Taken By:** 120318-0

Customer Comments Police requesting oil cleanup from MVA - Police #520154

Logs

Service Request Information (Hansen)

Hamilton

3569093

SR # 3569093

Request Type	TRACC - Roads - Accidents/Claims
Request Date	28/01/2014 20:38
Taken By	120318-0
Incident Date	28/01/2014 20:38
Priority	EMRG - Emergency
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS
Project	
Address	RED HILL VALLEY PKY HAMILTON
Location	AT KING STREET IN THE NBOUND LANE
Additional Information	Quantum has been called and clean-up has taken place on January 28 / 2014 , Paper work done by Dave Thomas.

Area	WARD4-5
Sub-area	
District	
Map #	
Reference #	
Source	
Last Modified By	RSPAGNUOLO
Last Modified Date Time	01/02/2014 8:25:41
Reviewed By	
Reviewed Date	

Inspection

Inspector	083540-0		
Scheduled	28/01/2014 20:38	Due By	
Started		Due By	
Completed		Due By	
Resolved	01/02/2014 08:25	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Severity 1

Contacts Information

Primary Caller — Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE DISPATCH			

EMAIL

Call Date: 28/01/2014 08:38 pm — Taken By: 120318-0

Customer Comments — mva fluid clean up. Police incident #520244

Logs

Service Request Information (Hansen)

Hamilton

3767046

SR #	**3767046**	Area	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	Sub-area	
Request Date	20/05/2014 21:59	District	
Taken By	112920-0	Map #	
Incident Date	20/05/2014 22:19	Reference #	
Priority		Source	
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Last Modified By	RSPAGNUOLO
Project		Last Modified Date Time	22/05/2014 15:02:39
Address	RED HILL VALLEY PKY HAMILTON	Reviewed By	
Location		Reviewed Date	

Additional Information: Quantum has been called and clean-up has taken place on May 20 / 2014 paper work done by G.Burgoin

Inspection

Inspector	083540-0		Severity	1
Scheduled		Due By		
Started		Due By		
Completed		Due By		
Resolved	22/05/2014 15:02	Due By		
Resolution	TRPS - PROBLEM SOLVED			

Contacts Information

Primary Caller — Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			

EMAIL

Call Date: 20/05/2014 09:59 pm   Taken By: 112920-0

Customer Comments: guard rail damage and fluid. Inc #P14-607555

Logs

Hamilton

Service Request Information (Hansen)

3831570

SR # 3831570

Request Type TRACC - Roads - Accidents/Claims

Request Date 07/07/2014 20:45

Taken By 112920-0

Incident Date 07/07/2014 22:19

Priority

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project

Address RED HILL VALLEY PKY / QUEENSTON RD HAMILTON

Location

Additional Information Quantum has been called an clean-up has taken place on July 07 / 2104 , Paper work done by Jay Uhelak and Damage to the guard rails pictures foward to Paul Mcshane by Supervisor Reinaldo Spagnuolo.

Area WARD4

Sub-area

District

Map #

Reference #

Source

Last Modified By RSPAGNUOLO

Last Modified Date Time 11/07/2014 18:24:21

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled **Due By**

Started **Due By**

Completed **Due By**

Resolved 11/07/2014 18:24 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone

EMAIL

Call Date: 07/07/2014 08:45 pm Taken By: 112920-0

Customer Comments south of Queenston. Damage to guard rail. P14-718344

Logs

Hamilton

Service Request Information (Hansen)

3843355

SR #	**3843355**	Area	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	Sub-area	
Request Date	17/07/2014 08:00	District	
Taken By	117961-0	Map #	
Incident Date	17/07/2014 08:00	Reference #	
Priority		Source	
Responsibility	TRND - ROADS NORTH	Last Modified By	KMARK
Project		Last Modified Date Time	18/07/2014 9:47:49
Address	RED HILL VALLEY PKY / BARTON ST E HAMILTON	Reviewed By	
Location		Reviewed Date	
Additional Information	Referred to D.N ForemenJULY 18/14 - DONE JULY 17/14		

Inspection

Inspector		Severity	1
Scheduled		Due By	
Started		Due By	
Completed		Due By	
Resolved	18/07/2014 09:47	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 17/07/2014 08:00 am **Taken By:** 117961-0

Customer Comments July 17,2014- Hamilton police are requesting clean up of tire debris (blown out tire) Red hill valley parkway, going South bound p14-726-309, Badge 105

Logs

Hamilton

Service Request Information (Hansen)

3845737

SR #	**3845737**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	19/07/2014 16:03	**District**	
Taken By	120318-0	**Map #**	
Incident Date	19/07/2014 16:03	**Reference #**	
		Source	
Priority		Last Modified By	SCAPOSTAGNO
		Last Modified Date Time	19/07/2014 18:14:08
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Reviewed By	
Project		Reviewed Date	
Address	RED HILL VALLEY PKY HAMILTON		
Location	NBOUND JUST BEFORE GREENHILL; ALL THE WAY ACROSS THE ROAD		
Additional Information	CALL SPILL		

Inspection

Inspector				Severity	1
Scheduled		**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	19/07/2014 18:14	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
FIRE DISPATCH			
		EMAIL	

Call Date: 19/07/2014 04:03 pm **Taken By:** 120318-0

Customer Comments Absorbent pick-up for MVA. Fire incident #F14022003. Police incident #728379

Logs

Hamilton

Service Request Information (Hansen)

3868527

SR #	**3868527**	Area	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	Sub-area	
Request Date	08/08/2014 18:50	District	
Taken By	117839-0	Map #	
Incident Date	08/08/2014 18:50	Reference #	
Priority		Source	
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Last Modified By	SCAPOSTAGNO
Project		Last Modified Date Time	08/08/2014 22:38:17
Address	RED HILL VALLEY PKY HAMILTON	Reviewed By	
Location	GOING SOUTHBOUND, 100M SOUTH OF THE DARTNALL EXIT	Reviewed Date	
Additional Information	call spill		

Inspection

Inspector	013956-0			Severity	1
Scheduled	08/08/2014 18:49	Due By			
Started		Due By			
Completed		Due By			
Resolved	08/08/2014 22:38	Due By			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller — Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON FIRE			

EMAIL

Call Date: 08/08/2014 06:50 pm — Taken By: 117839-0

Customer Comments: F14-024127 - request for absorbant clean up

Logs

Hamilton

Service Request Information (Hansen)

3904856

SR #	**3904856**	Area	WARD4
Request Type	TRACC - Roads - Accidents/Claims	Sub-area	
Request Date	06/09/2014 16:11	District	
Taken By	121648-0	Map #	
Incident Date	06/09/2014 16:11	Reference #	
Priority		Source	
Responsibility	TRAD - ROADS AFTER HOURS DAYS	Last Modified By	RSPAGNUOLO
Project		Last Modified Date Time	08/09/2014 20:10:12
		Reviewed By	
		Reviewed Date	

Address RED HILL VALLEY PKY / QUEENSTON RD HAMILTON

Location NORTH BOUND ON RED HILL BETWEEN QUEENSTON AND BARTON
DEBRIS FROM MVA REMAINS

Additional Information Debris has been pick-up on Sept/ 06 /2014 by K.Valodze.

Inspection

Inspector	083540-0	Severity	1
Scheduled	06/09/2014 16:14	Due By	
Started		Due By	
Completed		Due By	
Resolved	08/09/2014 20:10	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 06/09/2014 04:11 pm **Taken By:** 121648-0

Customer Comments incident no. 14770795

Logs

HAM0064439_0001
RHV0001045

Hamilton

Service Request Information (Hansen)

3910662

SR # 3910662

Request Type TRACC - Roads - Accidents/Claims

Request Date 10/09/2014 20:16

Taken By 112920-0

Incident Date 10/09/2014 20:16

Priority

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project

Address RED HILL VALLEY PKY HAMILTON

Location

Additional Information Aero Board was delivered by Jay Uhelak to Police on Sept/10/2014.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By RSPAGNUOLO

Last Modified Date Time 13/09/2014 8:26:39

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled		**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	13/09/2014 08:26	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			

EMAIL

Call Date: 10/09/2014 08:16 pm **Taken By:** 112920-0

Customer Comments request for arrowboard at S/B Mud/Stone Church exit due to mvc. Inc#P14-774508

Logs

Service Request Information (Hansen)

Hamilton

3910687

SR #	**3910687**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	10/09/2014 22:48	**District**	
Taken By	112920-0	**Map #**	
Incident Date	10/09/2014 22:48	**Reference #**	
		Source	
Priority		Last Modified By	RSPAGNUOLO
		Last Modified Date Time	13/09/2014 8:29:49
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Reviewed By	
Project		Reviewed Date	
Address	RED HILL VALLEY PKY HAMILTON		
Location			
Additional Information	Quantum has attended and clean-up has taken place on Sept/ 10 / 2014 and Paper work done by Jay Uhelak under John Durant directions due to change shift.		

Inspection

Inspector	083540-0			Severity	1
Scheduled		**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	13/09/2014 08:29	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			
		EMAIL	

Call Date: 10/09/2014 10:48 pm **Taken By:** 112920-0

Customer Comments N/B south of King. Guard rail damage. Inc #P14-774615

Logs

Hamilton

Service Request Information (Hansen)

3925074

SR #	**3925074**	Area	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	Sub-area	
Request Date	22/09/2014 22:56	District	
Taken By	112920-0	Map #	
Incident Date	22/09/2014 22:56	Reference #	
Priority		Source	
Responsibility	TRAN - ROADS AFTER HOURS NIGHTS	Last Modified By	JDURANT
Project		Last Modified Date Time	30/09/2014 0:47:17
Address	RED HILL VALLEY PKY HAMILTON	Reviewed By	
Location		Reviewed Date	
Additional Information	QUANTUM CALLED FOR SPILL CLEAN-UP		

Inspection

Inspector	056380-0	Severity	1
Scheduled		Due By	
Started		Due By	
Completed		Due By	
Resolved	30/09/2014 00:47	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller — Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			
		EMAIL	

Call Date: 22/09/2014 10:56 pm — Taken By: 112920-0

Customer Comments: S/B exit to Queenston. Fluid from mvc...Inc #P14-784514

Logs

Hamilton

Service Request Information (Hansen)

3943791

SR # 3943791

Request Type TRACC - Roads - Accidents/Claims
Request Date 08/10/2014 07:51
Taken By 113584-0
Incident Date 08/10/2014 07:51
Priority -
Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS
Project -
Address RED HILL VALLEY PKY HAMILTON
Location DARTNALL
Additional Information

Area WARD4-5
Sub-area
District
Map #
Reference #
Source
Last Modified By cspiak
Last Modified Date Time 17/03/2017 12:23:05
Reviewed By
Reviewed Date

Inspection

Inspector 021992-0
Severity 1
Scheduled 08/10/2014 07:58 **Due By**
Started **Due By**
Completed **Due By**
Resolved 17/03/2017 12:22 **Due By**
Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
FIRE			

EMAIL

Call Date: 08/10/2014 07:51 am **Taken By:** 113584-0

Customer Comments MVA--absorbant SB south of Dartnall--incident # F14030765 badge # 508

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 12:23:05PM	AGENCY06	Assumed complete - cspiak

Hamilton

Service Request Information (Hansen)

3962864

SR # **3962864**

Request Type TRACC - Roads - Accidents/Claims

Request Date 27/10/2014 07:57

Taken By 119206-0

Incident Date 27/10/2014 07:57

Priority EMRG - Emergency

Responsibility TRND - ROADS NORTH

Project

Address RED HILL VALLEY PKY HAMILTON

Location VEHICLE DEBRIS CLEANUP- INCIDENT# 14812425 - RED HILL NORTH AT QUEENSTON

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By JMANNING

Last Modified Date Time 28/10/2014 7:52:49

Reviewed By

Reviewed Date

Inspection

Inspector 105099-0

Severity 1

Scheduled 27/10/2014 08:00 **Due By**

Started **Due By**

Completed **Due By**

Resolved 28/10/2014 07:52 **Due By**

Resolution D - DEBRIS CLEANED UP

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 27/10/2014 07:57 am **Taken By:** 119206-0

Customer Comments Disptached to Roads North Jay Manning @ 8:01INCIDENT# 14812425

Logs

HAM0064439_0001
RHV0001045

Hamilton

Service Request Information (Hansen)

3962886

SR # 3962886

Request Type TRACC - Roads - Accidents/Claims

Request Date 27/10/2014 08:21

Taken By 119206-0

Incident Date 27/10/2014 08:21

Priority EMRG - Emergency

Responsibility TRND - ROADS NORTH

Project

Address RED HILL VALLEY PKY HAMILTON

Location @ QUEENSTON - ABSOBANT

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By JMANNING

Last Modified Date Time 28/10/2014 7:50:09

Reviewed By

Reviewed Date

Inspection

Inspector 105099-0

Severity 1

Scheduled 27/10/2014 08:21 **Due By**

Started **Due By**

Completed **Due By**

Resolved 28/10/2014 07:50 **Due By**

Resolution D - DEBRIS CLEANED UP

Contacts Information

Primary Caller

Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON FIRE			

EMAIL

Call Date: 27/10/2014 08:21 am   Taken By: 119206-0

Customer Comments   incident# f14032711 - red hill and king north boundfire laid absorbant, asking if we can clean up.

Logs

Hamilton

Service Request Information (Hansen)

3968001

SR #	**3968001**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	31/10/2014 19:37	**District**	
Taken By	117839-0	**Map #**	
Incident Date	31/10/2014 19:37	**Reference #**	
		Source	
Priority		Last Modified By	RSPAGNUOLO
		Last Modified Date Time	02/11/2014 11:18:17
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Reviewed By	
Project		Reviewed Date	
Address	RED HILL VALLEY PKY HAMILTON		
Location	AT KING GOING NORTHBOUND		
Additional Information	Quantum attended and clean up has taken place on Ocotber 31/2014 paper work done by John Corsini and Dave Desjardins also attended location.		

Inspection

Inspector	083540-0		Severity	1
Scheduled	31/10/2014 19:37	**Due By**		
Started		**Due By**		
Completed		**Due By**		
Resolved	02/11/2014 11:18	**Due By**		
Resolution	TRPS - PROBLEM SOLVED			

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			
		EMAIL	

Call Date: 31/10/2014 07:37 pm **Taken By:** 117839-0

Customer Comments Incident P14-815985 - 6 car pile up - request for fluids and debris clean up

Logs

Hamilton

Service Request Information (Hansen)

3968531

SR # 3968531

Request Type TRACC - Roads - Accidents/Claims

Request Date 01/11/2014 16:26

Taken By 107516-1

Incident Date 01/11/2014 16:26

Priority EMRG - Emergency

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project

Address RED HILL VALLEY PKY HAMILTON

Location ON RAMP TO GREEN HILL

Additional Information Gate Pole has been damage it was foward to Traffic Dept. to replace signages and pictures to Paul McShane for permanente repairs .Replaced damaged markers on 10/11/2014 by #091189-0

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By CDELLAPIETRA

Last Modified Date Time 13/11/2014 16:10:47

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled 01/11/2014 16:26 **Due By**

Started **Due By**

Completed **Due By**

Resolved 02/11/2014 11:26 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 01/11/2014 04:26 pm **Taken By:** 107516-1

Customer Comments MVA - gate on the on ramp onto the north bound green hill - pole to lock the gate is damagerd and two florescent poles - Incident # 816 413

Logs

Hamilton

Service Request Information (Hansen)

3974873

SR # 3974873

Request Type TRACC - Roads - Accidents/Claims

Request Date 08/11/2014 19:53

Taken By 107516-1

Incident Date 08/11/2014 19:53

Priority EMRG - Emergency

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location @ KING

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By cspiak

Last Modified Date Time 17/03/2017 12:26:35

Reviewed By

Reviewed Date

Inspection

Inspector 058830-0

Severity 1

Scheduled 08/11/2014 19:52 **Due By**

Started **Due By**

Completed **Due By**

Resolved 17/03/2017 12:26 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 08/11/2014 07:53 pm **Taken By:** 107516-1

Customer Comments damage on red hill - north bound ramp from king street, guard rail has been damage and the reflectors - Incident # P14 822 091

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 12:26:35PM	AGENCY06	Assumed complete - cspiak

Hamilton

Service Request Information (Hansen)

3976868

SR # **3976868**

Request Type TRACC - Roads - Accidents/Claims

Request Date 11/11/2014 06:56

Taken By 115417-0

Incident Date 11/11/2014 06:56

Priority -

Responsibility TRND - ROADS NORTH

Project -

Address RED HILL VALLEY PKY HAMILTON

Location NORTH BOUND JUST BEFORE QEW NIAGARA

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By cspiak

Last Modified Date Time 17/03/2017 12:27:31

Reviewed By

Reviewed Date

Inspection

Inspector 105099-0

Severity 1

Scheduled 11/11/2014 07:00 **Due By**

Started **Due By**

Completed **Due By**

Resolved 17/03/2017 12:27 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 11/11/2014 06:56 am Taken By: 115417-0

Customer Comments fluid clean up from mvc - incident #823 792

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 12:27:30PM	AGENCY06	Assumed complete - cspiak

Hamilton

Service Request Information (Hansen)

3979842

SR # 3979842

Request Type TRACC - Roads - Accidents/Claims

Request Date 13/11/2014 16:43

Taken By 119206-0

Incident Date 13/11/2014 16:43

Priority EMRG - Emergency

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location HAMILTON POLICE CALLED IN REGARDS TO NORTH BOUND ON REDHILL WHERE @ MUD/STONECHURCH ON RAMP - DRYWALL AND WOOD CLEAN UP - INCIDENT# 825492

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By cspiak

Last Modified Date Time 17/03/2017 12:28:32

Reviewed By

Reviewed Date

Additional Information

Inspection

Inspector 058830-0

Severity 1

Scheduled	13/11/2014 16:43	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	17/03/2017 12:28	**Due By**	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 13/11/2014 04:43 pm **Taken By:** 119206-0

Customer Comments HAMILTON POLICE CALLED IN REGARDS TO NORTH BOUND ON REDHILL WHERE @ MUD/STONECHURCH ON RAMP - DRYWALL AND WOOD CLEAN UP - INCIDENT# 825492dispatched to #306 @ 16:43 for clean up.

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 12:28:32PM	AGENCY06	Assumed complete - cspiak

Hamilton

Service Request Information (Hansen)

3984357

SR #	**3984357**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	18/11/2014 17:37	**District**	
Taken By	121849-0	**Map #**	
Incident Date	18/11/2014 17:37	**Reference #**	
Priority	-	**Source**	
		Last Modified By	cspiak
		Last Modified Date Time	17/03/2017 13:44:46
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Reviewed By	
Project	-	Reviewed Date	
Address	RED HILL VALLEY PKY HAMILTON		
Location	S BOUND RED HILL VALLEY , WHERE HWY MEETS THE LINCOLN, THERE IS A LARGE METAL COIL IN THE LANE. CALLED IN BY POLICE INCIDENT #14-829055		
Additional Information			

Inspection

Inspector		Severity	1
Scheduled		**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	17/03/2017 13:44	**Due By**	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
		EMAIL	

Call Date: 18/11/2014 05:37 pm **Taken By:** 121849-0

Customer Comments

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 1:44:00PM	AGENCY06	Assumed complete - cspiak

Hamilton

Service Request Information (Hansen)

3988331

SR # 3988331

Request Type TRACC - Roads - Accidents/Claims

Request Date 23/11/2014 17:15

Taken By 121849-0

Incident Date 23/11/2014 17:15

Priority

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project

Address RED HILL VALLEY PKY HAMILTON

Location SOUTH BOUND OFF RAMP-DEBRIS CLEAN UP AND RAMP BLOCKING. INCIDENT # 14-832602

Additional Information Location has been check and no action required at this time it was checked by Karl Valodze on November,23/2014.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By RSPAGNUOLO

Last Modified Date Time 29/11/2014 7:21:32

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled 23/11/2014 17:13 **Due By**

Started **Due By**

Completed **Due By**

Resolved 29/11/2014 07:21 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
		EMAIL	

Call Date: 23/11/2014 05:15 pm **Taken By:** 121849-0

Customer Comments

Logs

Hamilton

Service Request Information (Hansen)

3993172

SR #	**3993172**	Area	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	Sub-area	
Request Date	27/11/2014 16:51	District	
Taken By	121849-0	Map #	
Incident Date	27/11/2014 16:51	Reference #	
Priority		Source	
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Last Modified By	RSPAGNUOLO
Project		Last Modified Date Time	29/11/2014 7:50:20
		Reviewed By	
		Reviewed Date	

Address RED HILL VALLEY PKY HAMILTON

Location @ STONECHURCH EXIT SOUTHBOUND, POLICE RESPONDING TO MVA, ICY ROAD CONDITIONS. INCIDENT # 14-835788

Additional Information As I was off on this date the call was handed by Supervisor John Scipione, on November 27/2014.

Inspection

Inspector	083540-0	Severity	1
Scheduled	27/11/2014 16:50	Due By	
Started		Due By	
Completed		Due By	
Resolved	29/11/2014 07:50	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
		EMAIL	

Call Date: 27/11/2014 04:51 pm **Taken By:** 121849-0

Customer Comments

Logs

Hamilton

Service Request Information (Hansen)

3997790

SR # 3997790

Request Type TRACC - Roads - Accidents/Claims

Request Date 03/12/2014 07:53

Taken By 113451-0

Incident Date 03/12/2014 07:53

Priority

Responsibility TRND - ROADS NORTH

Project

Address RED HILL VALLEY PKY HAMILTON

Location N/B SOUTH OF KING

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By JMANNING

Last Modified Date Time 04/12/2014 7:29:57

Reviewed By

Reviewed Date

Inspection

Inspector 105099-0

Severity 1

Scheduled		**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	04/12/2014 07:29	**Due By**	

Resolution D - DEBRIS CLEANED UP

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON FIRE			

EMAIL

Call Date: 03/12/2014 07:53 am **Taken By:** 113451-0

Customer Comments Absorbant cleanup from MVC. Inc# F14-036884Incident # P14 839 823

Logs

Hamilton

Service Request Information (Hansen)

4018237

SR # 4018237

Request Type TRACC - Roads - Accidents/Claims

Request Date 25/12/2014 08:55

Taken By 120322-0

Incident Date 25/12/2014 08:55

Priority EMRG - Emergency

Responsibility TRAD - ROADS AFTER HOURS DAYS

Project

Address RED HILL VALLEY PKY HAMILTON

Location NORTH BOUND LANES JUST SOUTH OF KING STREET - DAMAGED GUARD RAILS

Additional Information Quantum has been called and clean-up has taken place on Dec/25/2014 Paper work done by Chris Marchionda.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By RSPAGNUOLO

Last Modified Date Time 28/12/2014 10:06:51

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0 Severity 1

Scheduled 25/12/2014 09:04 **Due By**

Started **Due By**

Completed **Due By**

Resolved 28/12/2014 10:06 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 25/12/2014 08:55 am **Taken By:** 120322-0

Customer Comments as per the Hamilton Police there is an accident at the locaton provided - extensive damage to the guadrailsPolice Incident #855590

Logs

Hamilton

Service Request Information (Hansen)

4018248

SR #	**4018248**	Area	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	Sub-area	
Request Date	25/12/2014 11:02	District	
Taken By	120322-0	Map #	
Incident Date	25/12/2014 11:02	Reference #	
Priority	EMRG - Emergency	Source	
Responsibility	TRAD - ROADS AFTER HOURS DAYS	Last Modified By	RSPAGNUOLO
Project		Last Modified Date Time	28/12/2014 10:11:28
		Reviewed By	
		Reviewed Date	

Address RED HILL VALLEY PKY HAMILTON

Location RED HILL VALLEY PARKWAY - @ QUEENSTON RAMP - ACCIDENT - GUARDRAIL HIT AND DAMAGED

Additional Information Damage has been reported with Pictures sent to Paul Mcshane on Dec/28/2014. Paper work done by C.Marchionda.

Inspection

Inspector	083540-0			Severity	1
Scheduled	25/12/2014 11:18	Due By			
Started		Due By			
Completed		Due By			
Resolved	28/12/2014 10:11	Due By			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			
		EMAIL	

Call Date: 25/12/2014 11:02 am **Taken By:** 120322-0

Customer Comments RED HILL VALLEY PARKWAY - @ QUEENSTON RAMP - ACCIDENT - GUARDRAIL HIT AND DAMAGEDPolice Incident #14-855625

Logs

Hamilton

Service Request Information (Hansen)

4018249

SR # 4018249

Request Type TRACC - Roads - Accidents/Claims

Request Date 25/12/2014 11:02

Taken By 120322-0

Incident Date 25/12/2014 11:02

Priority EMRG - Emergency

Responsibility TRAD - ROADS AFTER HOURS DAYS

Project

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By RSPAGNUOLO

Last Modified Date Time 28/12/2014 10:12:49

Reviewed By

Reviewed Date

Address RED HILL VALLEY PKY HAMILTON

Location RED HILL VALLEY PARKWAY - @ KING STREET EXIT/RAMP - ACCIDENT - GUARDRAIL HIT AND DAMAGED

Additional Information Quantum has been called and clean-up has taken place on Dec/25/2014 and Paper work done by C. Marchionda , Pictures fowarded to Paul Mcshane on Dec/28/2014.

Inspection

Inspector 083540-0

Severity 1

Scheduled	25/12/2014 11:18	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	28/12/2014 10:12	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 25/12/2014 11:02 am **Taken By:** 120322-0

Customer Comments RED HILL VALLEY PARKWAY - @ KING STREET EXIT/RAMP - ACCIDENT - GUARDRAIL HIT AND DAMAGEDPolice Incident #14-855642- PONIAC #14-855632- MAZDA 3

Logs

Service Request Information (Hansen)

Hamilton

4018251

SR # 4018251

Request Type TRACC - Roads - Accidents/Claims
Request Date 25/12/2014 11:27
Taken By 120322-0
Incident Date 25/12/2014 11:27
Priority EMRG - Emergency
Responsibility TRAD - ROADS AFTER HOURS DAYS
Project
Address RED HILL VALLEY PKY HAMILTON
Location ACCIDENT ON RED HILL VALLEY PKY AT GREENHILL EXIT - GUARD RAIL DAMAGED
Additional Information Damage has been reported and pictures sent to Paul Mcshane on Dec/28/2014 Paper work done by Chris Marchionda.

Area WARD4-5
Sub-area
District
Map #
Reference #
Source
Last Modified By RSPAGNUOLO
Last Modified Date Time 28/12/2014 10:15:51
Reviewed By
Reviewed Date

Inspection

Inspector 083540-0
Severity 1

Scheduled 25/12/2014 11:29 **Due By**
Started **Due By**
Completed **Due By**
Resolved 28/12/2014 10:15 **Due By**
Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 25/12/2014 11:27 am **Taken By:** 120322-0

Customer Comments POLICE INCIDENT #855632ACCIDENT ON THE RED HILL VALLEY PKY AT GREENHILL EXIT - GUARD RAIL DAMAGED

Logs

Hamilton

Service Request Information (Hansen)

4018282

SR # **4018282**

Request Type TRACC - Roads - Accidents/Claims

Request Date 25/12/2014 00:08

Taken By 107516-1

Incident Date 25/12/2014 00:08

Priority EMRG - Emergency

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project

Address RED HILL VALLEY PKY HAMILTON

Location KING OFF RAMP

Additional Information NOTE: Patrick called this into me at 23:00 as he needed the Officer Name. I could not locate a Hansen in the system for this call so I created one.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By PMAFFEI

Last Modified Date Time 14/01/2015 0:10:16

Reviewed By

Reviewed Date

Inspection

Inspector 121999-0

Severity 1

Scheduled 25/12/2014 23:04 **Due By**

Started **Due By**

Completed **Due By**

Resolved 14/01/2015 00:10 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
PATRICK ROADS NORTH		( ) - [redacted]	

EMAIL

Call Date: 25/12/2014 12:08 am **Taken By:** 107516-1

Customer Comments MVA debris and guardrail damage. Retaining wall damaged Incident # P14 855 469 Officer Buck on site badge #359

Logs

Hamilton

Service Request Information (Hansen)

4022890

SR # **4022890**

Request Type TRACC - Roads - Accidents/Claims

Request Date 01/01/2015 14:35

Taken By 107516-1

Incident Date 01/01/2015 14:35

Priority EMRG - Emergency

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project

Address RED HILL VALLEY PKY HAMILTON

Location SOUTH OF GREENHILL

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By LBROWNE

Last Modified Date Time 01/01/2015 21:00:25

Reviewed By

Reviewed Date

Inspection

Inspector 110225-0

Severity 1

Scheduled 01/01/2015 14:35 **Due By**

Started **Due By**

Completed **Due By**

Resolved 01/01/2015 21:00 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 01/01/2015 02:35 pm **Taken By:** 107516-1

Customer Comments South bound lane rolling construction pilon - south of green hill Incident P15 500 404 >> Karl Valodze responded to the call and picked up the barrel in question and the placed it back where the rest of them were. In front of a damaged guard rail.

Logs

Hamilton

Service Request Information (Hansen)

12909326

SR #	**12909326**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	23/01/2015 16:35	**District**	
Taken By	107516-1	**Map #**	
Incident Date		**Reference #**	
		Source	
		Last Modified By	SCAPOSTAGNO
Priority	EMRG - Emergency	Last Modified Date Time	23/01/2015 18:07:03
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Reviewed By	
Project		Reviewed Date	
Address	RED HILL VALLEY PKY / BARTON ST E HAMILTON		
Location	SOUTHBOUND BETWEEN BARTON AND QUEENSTON		
Additional Information	call spill		

Inspection

Inspector	013956-0			Severity	1
Scheduled	23/01/2015 16:41	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	23/01/2015 18:06	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			
		EMAIL	

Call Date: 23/01/2015 04:35 pm **Taken By:** 107516-1

Customer Comments fluid clean MVA - Incident # P 15 517 234

Logs

Hamilton

Service Request Information (Hansen)

12953241

SR #	**12953241**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	27/02/2015 08:17	**District**	
Taken By	107516-1	**Map #**	
Incident Date		**Reference #**	
		Source	
Priority	EMRG - Emergency	Last Modified By	cagallant
Responsibility	TRND - ROADS NORTH	Last Modified Date Time	07/02/2017 14:54:50
Project	-	Reviewed By	
		Reviewed Date	
Address	RED HILL VALLEY PKY / BARTON ST E HAMILTON		
Location	between Barton and Queenston		
Additional Information			

Inspection

Inspector	105099-0			Severity	1
Scheduled	27/02/2015 08:22	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	07/02/2017 14:54	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			
		EMAIL	

Call Date: 27/02/2015 08:17 am **Taken By:** 107516-1

Customer Comments Roof top sign from a truck school - south bound between Barton and Queenston - Incident # 15 543 452

Logs

Hamilton

Service Request Information (Hansen)

12955845

SR #	**12955845**	Area	WARD4
Request Type	TRACC - Roads - Accidents/Claims	Sub-area	
Request Date	28/02/2015 15:30	District	
Taken By	119206-0	Map #	
Incident Date		Reference #	
		Source	
Priority	EMRG - Emergency	Last Modified By	gmckerracher
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Last Modified Date Time	05/03/2015 15:09:54
Project	-	Reviewed By	
		Reviewed Date	

Address RED HILL VALLEY PKY / PND RED HILL VALLEY WD 4 HAMILTON

Location south of Barton street, NB lane, car hit guard rail - debris clean up needed - incident #544554

Additional Information James West responded to the call and with the help of the Tow truck driver the debri was removed.

Inspection

Inspector	110225-0		Severity	1
Scheduled	28/02/2015 15:36	Due By		
Started		Due By		
Completed		Due By		
Resolved	28/02/2015 16:23	Due By		
Resolution	TRWIP - WORK IN PROGRESS			

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
police			

EMAIL

Call Date: 28/02/2015 03:30 pm **Taken By:** 119206-0

Customer Comments South of Barton street, NB lane, car hit guard rail - debris clean up needed - incident #544554 - dispatched to les brown @ 15:35

Logs

Log Type and Description	Start Date Time	Started By	Comments
HPESV - SITE VISIT	3/3/2015 2:01:00PM	057830-0	1.7 meters needs to be re-straitening on the west side for the reflective end cap marker 1 steel post needs to be re-straiten

Hamilton

Service Request Information (Hansen)

12998189

SR # 12998189

Request Type TRACC - Roads - Accidents/Claims
Request Date 25/03/2015 17:10
Taken By 113451-0
Incident Date
Priority -
Responsibility TRND - ROADS NORTH
Project -
Address RED HILL VALLEY PKY HAMILTON
Location Between King and Queenston, N/B
Additional Information Pictures has been taken from that Guard-Rail and foward to the investigators at North District. Paper work done by Chris Marchionda on March , 25/2015.

Area WARD4-5
Sub-area
District
Map #
Reference #
Source
Last Modified By rspagnuolo
Last Modified Date Time 30/03/2015 17:49:08
Reviewed By
Reviewed Date

Inspection

Inspector 083540-0
Severity 1
Scheduled 25/03/2015 17:18 **Due By**
Started **Due By**
Completed **Due By**
Resolved 27/03/2015 07:35 **Due By**
Resolution TRWIP - WORK IN PROGRESS

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Hamilton Police			

EMAIL

Call Date: 25/03/2015 05:10 pm **Taken By:** 113451-0

Customer Comments Guardrail damage from MVC. Inc# P15-563972

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/27/2015 7:46:22AM	057830-0	11.34 meters of guard rail needs to be replace Ref to Paul McShane for repair Ref # AC7N-15181 Work Order # 5110671

Hamilton

Service Request Information (Hansen)

13002288

SR # 13002288

Request Type TRACC - Roads - Accidents/Claims

Request Date 28/03/2015 22:53

Taken By 121073-0

Incident Date

Priority -

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project -

Address RED HILL VALLEY PKY / PND RED HILL VALLEY WD 4 HAMILTON

Location NORTH BOUND LANES - NORTH OF MUD - VEH INTO GUARD RAIL

Additional Information MVA on the RHVP this morning. A car stuck the concrete barrier on the north bound side. Damage to the barrier and no injuries were reported. Air temp was -6, and road -8, road conditions were B/D. Quantum was called in for fluid clean-up.

P15 566 560
PC Mitchell # 1223

Area WARD4

Sub-area

District

Map #

Reference #

Source

Last Modified By pmaffei

Last Modified Date Time 31/03/2015 1:19:22

Reviewed By

Reviewed Date

Inspection

Inspector 121999-0

Severity 1

Scheduled	28/03/2015 23:05	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	31/03/2015 01:19	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller

Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE - 566560			

EMAIL

Call Date: 28/03/2015 10:53 pm **Taken By:** 121073-0

Customer Comments

Logs

Service Request Information (Hansen)

Hamilton

13015194

SR # **13015194**

Request Type TRACC - Roads - Accidents/Claims

Request Date 08/04/2015 05:35

Taken By 115417-0

Incident Date

Priority -

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location MUD STREET ON RAMP - POLE TAKEN OUT

Additional Information No pole taken out, just a traffic marker that was written up and taken to traffic yard. Ed Wood on site

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By pmaffei

Last Modified Date Time 16/04/2015 5:30:55

Reviewed By

Reviewed Date

Inspection

Inspector 121999-0

Severity 1

Scheduled		**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	16/04/2015 05:30	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 08/04/2015 05:35 am **Taken By:** 115417-0

Customer Comments INCIDENT #15 574 314

Logs

Hamilton

Service Request Information (Hansen)

13017380

SR # 13017380

Request Type TRACC - Roads - Accidents/Claims

Request Date 08/04/2015 19:35

Taken By 117839-0

Incident Date

Priority EMRG - Emergency

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location heading northbound on Red Hill just at the Mount Albion overpass

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By gmckerracher

Last Modified Date Time 09/04/2015 15:26:45

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled 08/04/2015 19:37 **Due By**

Started **Due By**

Completed **Due By**

Resolved 09/04/2015 10:11 **Due By**

Resolution HPENP - NO PROBLEM FOUND

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Hamilton Police			

EMAIL

Call Date: 08/04/2015 07:35 pm **Taken By:** 117839-0

Customer Comments Incident P15-574815 - MVC car has hit the guardrail Police on scene.

Logs

Log Type and Description	Start Date Time	Started By	Comments
HPESV - SITE VISIT	4/9/2015 3:26:00PM	057830-0	no problem found with guardrail all is in good working condition. 150 meters to the south of this location is a damage guard rail

Hamilton

Service Request Information (Hansen)

13040242

SR #	**13040242**	**Area**	WARD4
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	21/04/2015 17:32	**District**	
Taken By	121073-0	**Map #**	
Incident Date		**Reference #**	
Priority	-	**Source**	
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Last Modified By	gmckerracher
Project	-	Last Modified Date Time	28/04/2015 7:23:34
Address	RED HILL VALLEY PKY / QUEENSTON RD HAMILTON	Reviewed By	
Location	GUARD RAIL DAMAGED - NORTH BOUND LANES - BETWEEN KING & QUEENSTON	Reviewed Date	
Additional Information			

Inspection

Inspector	013956-0			Severity	1
Scheduled	21/04/2015 17:38	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	21/04/2015 18:43	**Due By**			
Resolution	TRWIP - WORK IN PROGRESS				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE - P15-584-924			

EMAIL

Call Date: 21/04/2015 05:32 pm **Taken By:** 121073-0

Customer Comments 12 meters of guard rail needs to be replace, 4 steel post, 4 wooden blocks are in need to be replace
repair sheet has been sent to Paul McShane with Work order # 5119002 REFF # AC7N-240 as been set up for this repair.

Logs

Hamilton

Service Request Information (Hansen)

13066417

SR # 13066417

Request Type	TRACC - Roads - Accidents/Claims
Request Date	06/05/2015 04:51
Taken By	115417-0
Incident Date	
Priority	-
Responsibility	TRAN - ROADS AFTER HOURS NIGHTS
Project	-
Address	RED HILL VALLEY PKY HAMILTON
Location	SB @ KING ST
Additional Information	QUANTUM HAS BEEN CALLED FOR ALL FLUID CLEAN-UP.

Area	WARD4-5
Sub-area	
District	
Map #	
Reference #	
Source	
Last Modified By	jdurant
Last Modified Date Time	07/05/2015 5:15:10
Reviewed By	
Reviewed Date	

Inspection

Inspector	023545-0		
Scheduled	06/05/2015 04:51	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	07/05/2015 05:14	**Due By**	
Resolution	TRPS - PROBLEM SOLVED		

Severity 1

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 06/05/2015 04:51 am **Taken By:** 115417-0

Customer Comments FLUID, DEBRIS & BIO-HAZARD CLEAN UP
INCIDENT # 15 596 572

Logs

Service Request Information (Hansen)

Hamilton

13083454

SR # 13083454

Request Type TRACC - Roads - Accidents/Claims

Request Date 15/05/2015 02:16

Taken By 122088-0

Incident Date

Priority -

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location northbound fast lane just s of Greenhill ave exit - large dark object debris

Additional Information Debris safely removed from RHVP. J. Chiarelli onsite

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By pmaffei

Last Modified Date Time 20/05/2015 22:52:02

Reviewed By

Reviewed Date

Inspection

Inspector 121999-0

Severity 1

Scheduled	15/05/2015 02:22	Due By	
Started		Due By	
Completed		Due By	
Resolved	20/05/2015 22:51	Due By	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HPolice			

EMAIL

Call Date: 15/05/2015 02:16 am **Taken By:** 122088-0

Customer Comments Incident # p15-604757, northbound fast lane just s of Greenhill ave exit - large dark object/debris

Logs

Hamilton

Service Request Information (Hansen)

13097221

SR # 13097221

Request Type TRACC - Roads - Accidents/Claims

Request Date 23/05/2015 11:05

Taken By 121073-0

Incident Date

Priority -

Responsibility TRAD - ROADS AFTER HOURS DAYS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location north bound before mud st on ramp - fluid and debris

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By gmckerracher

Last Modified Date Time 26/05/2015 15:07:28

Reviewed By

Reviewed Date

Inspection

Inspector 013956-0

Severity 1

Scheduled 23/05/2015 11:07 **Due By**

Started **Due By**

Completed **Due By**

Resolved 26/05/2015 14:38 **Due By**

Resolution TRWIP - WORK IN PROGRESS

Contacts Information

Primary Caller

Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
police 15-611945			

EMAIL

Call Date: 23/05/2015 11:05 am **Taken By:** 121073-0

Customer Comments

Logs

Log Type and Description	Start Date Time	Started By	Comments
HPSDW - INSPECTIONS	5/26/2015 3:07:28PM	057830-0	8 meters of guard rail needs to be replace REFF # to Paul McShane for repair. REFF # AC7N-15323 Work Oder # 5134924

Hamilton

Service Request Information (Hansen)

13111151

SR #	**13111151**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	31/05/2015 17:06	**District**	
Taken By	120322-0	**Map #**	
Incident Date		**Reference #**	
		Source	
Priority	EMRG - Emergency	Last Modified By	gmckerracher
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Last Modified Date Time	04/06/2015 8:08:13
Project	-	Reviewed By	
		Reviewed Date	
Address	RED HILL VALLEY PKY HAMILTON		
Location	on the Redhill Valley Pkwy - north bound in center lane - just south of King		
Additional Information			

Inspection

Inspector	013956-0			Severity	1
Scheduled	31/05/2015 17:08	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	04/06/2015 07:43	**Due By**			
Resolution	TRWIP - WORK IN PROGRESS				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Hamilton Police			

EMAIL

Call Date: 31/05/2015 05:06 pm **Taken By:** 120322-0

Customer Comments Police Incident #15-619319
as per Hamilton Police they need fluid cleanup at the location provided due to an MVC

Logs

Log Type and Description	Start Date Time	Started By	Comments
DESITE - SITE VISIT	6/4/2015 8:08:00AM	057830-0	22 meters of guardrail needs replacing 5 steel post needs replacing & 5 steel post needs to be straightened 4 bumper needs to be reset REF #AC7N-15356 W/O #5139096 Sent to Paul McShane for repair.

Hamilton

Service Request Information (Hansen)

13138199

SR # 13138199

Request Type TRACC - Roads - Accidents/Claims

Request Date 14/06/2015 14:31

Taken By 119206-0

Incident Date

Priority EMRG - Emergency

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location red hill valley parkway, mud street on ramp - car flipped over, reflectors taken out, please investigate- incident # 631014
transmission fluid also

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By scapostagno

Last Modified Date Time 14/06/2015 18:38:16

Reviewed By

Reviewed Date

Inspection

Inspector 013956-0

Severity 1

Scheduled 14/06/2015 14:39 **Due By**

Started **Due By**

Completed **Due By**

Resolved 14/06/2015 18:38 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller

Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Hamilton police			

EMAIL

Call Date: 14/06/2015 02:31 pm **Taken By:** 119206-0

Customer Comments Called over to #705 @ 14:34 and Reinaldo asked that we hold this call for Sam Capostagno #701 when he comes on at 3pm

Logs

Hamilton

Service Request Information (Hansen)

13164872

SR #	**13164872**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	27/06/2015 18:06	**District**	
Taken By	119206-0	**Map #**	
Incident Date		**Reference #**	
		Source	
Priority	EMRG - Emergency	Last Modified By	scapostagno
		Last Modified Date Time	27/06/2015 19:23:51
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Reviewed By	
Project	-	Reviewed Date	

Address RED HILL VALLEY PKY HAMILTON

Location redhill valley parkway going north bound towards the greenhill exit - a blue Honda civic done some damage to guard rail
incident # 642552

Additional Information

Inspection

Inspector	013956-0		Severity 1
Scheduled	27/06/2015 18:09	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	27/06/2015 19:23	**Due By**	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
hamilton police			

EMAIL

Call Date: 27/06/2015 06:06 pm **Taken By:** 119206-0

Customer Comments redhill valley parkway going north bound towards the greenhill exit - a blue Honda civic done some damage to guard rail
incident # 642552

Logs

Hamilton

Service Request Information (Hansen)

13164902

SR #	**13164902**	**Area**	WARD4
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	27/06/2015 20:38	**District**	
Taken By	121849-0	**Map #**	
Incident Date		**Reference #**	
Priority	-	**Source**	
Responsibility	TRAN - ROADS AFTER HOURS NIGHTS	Last Modified By	cspiak
Project	-	Last Modified Date Time	17/03/2017 15:02:07
Address	RED HILL VALLEY PKY / QUEENSTON RD HAMILTON	Reviewed By	
Location	police incident # 15-642676 Guard raid damaged.	Reviewed Date	
Additional Information			

Inspection

Inspector	013956-0			Severity	1
Scheduled	27/06/2015 21:02	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	17/03/2017 15:01	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Police			

EMAIL

Call Date: 27/06/2015 08:38 pm **Taken By:** 121849-0

Customer Comments

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 3:02:08PM	AGENCY06	Assumed complete - cspiak

Service Request Information (Hansen)

Hamilton

13164983

SR # 13164983

Area WARD4

Sub-area

District

Map #

Reference #

Source

Request Type TRACC - Roads - Accidents/Claims

Request Date 28/06/2015 09:22

Taken By 121849-0

Incident Date

Priority -

Responsibility TRAD - ROADS AFTER HOURS DAYS

Project -

Last Modified By rspagnuolo

Last Modified Date Time 06/07/2015 15:39:08

Reviewed By

Reviewed Date

Address RED HILL VALLEY PKY HAMILTON

Location @ Green hill, bridge for CN rail, underneath, guard rail damaged from MVA 15-643007

Additional Information Quantum has been called and clean-up has taken place on June 28 / 2015 and paper work done by Chris Marchionda.

Inspection

Inspector 083540-0

Severity 1

Scheduled 28/06/2015 09:30 **Due By**

Started **Due By**

Completed **Due By**

Resolved 28/06/2015 15:38 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
		EMAIL	

Call Date: 28/06/2015 09:22 am **Taken By:** 121849-0

Customer Comments

Logs

Service Request Information (Hansen)

Hamilton

13165039

SR # **13165039**

Request Type	TRACC - Roads - Accidents/Claims
Request Date	28/06/2015 12:51
Taken By	121849-0
Incident Date	
Priority	-
Responsibility	TRAD - ROADS AFTER HOURS DAYS
Project	-
Address	RED HILL VALLEY PKY HAMILTON
Location	MVA fluid and debris clean up F15-020862
Additional Information	Quantum was called and clean-up ha staken place on June 28 / 2015 and Paper work done by Chris Marchionda.

Area	WARD4-5
Sub-area	
District	
Map #	
Reference #	
Source	
Last Modified By	rspagnuolo
Last Modified Date Time	06/07/2015 18:28:09
Reviewed By	
Reviewed Date	

Inspection

Inspector	083540-0	Severity	1
Scheduled	28/06/2015 12:52	Due By	
Started		Due By	
Completed		Due By	
Resolved	28/06/2015 18:26	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller — Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Fire			

EMAIL

Call Date: 28/06/2015 12:51 pm — Taken By: 121849-0

Customer Comments

Logs

Hamilton

Service Request Information (Hansen)

13165041

SR # 13165041

Request Type TRACC - Roads - Accidents/Claims

Request Date 28/06/2015 12:51

Taken By 121073-0

Incident Date

Priority -

Responsibility TRAD - ROADS AFTER HOURS DAYS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location NORTH BOUND ON THE KING ST OFF RAMP - ON BEND - WANT CONES & ARROW BOARD IF WE HAVE IT

Additional Information I spoke to the Officer and No Cones or Arrow Board was need anymore. On june 28 / 2015 .

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By rspagnuolo

Last Modified Date Time 06/07/2015 18:22:07

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled 28/06/2015 13:02 **Due By**

Started **Due By**

Completed **Due By**

Resolved 28/06/2015 18:21 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE - 643211			

EMAIL

Call Date: 28/06/2015 12:51 pm **Taken By:** 121073-0

Customer Comments

Logs

Hamilton

Service Request Information (Hansen)

13165073

SR # 13165073

Request Type	TRACC - Roads - Accidents/Claims	**Area**	WARD4-5
Request Date	28/06/2015 14:44	**Sub-area**	
Taken By	121849-0	**District**	
Incident Date		**Map #**	
Priority	-	**Reference #**	
Responsibility	TRAD - ROADS AFTER HOURS DAYS	**Source**	
Project	-	Last Modified By	rspagnuolo
		Last Modified Date Time	06/07/2015 18:41:09
		Reviewed By	
		Reviewed Date	

Address RED HILL VALLEY PKY HAMILTON

Location @ Green Hill - steel rebar in lanes and Tent @ Mud.
Police incident # 15-643211 (steel) & 15-643208 (tent tarp)

Additional Information Patrol Man did find debris and tarp but no rebar on June 28 / 2015. Checked by Jim West , Christopher Hasse and
Antony Spagnuolo.

Inspection

Inspector	083540-0	Severity	1
Scheduled	28/06/2015 14:49	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	28/06/2015 18:40	**Due By**	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
police			
		EMAIL	

Call Date: 28/06/2015 02:44 pm **Taken By:** 121849-0

Customer Comments

Logs

Hamilton

Service Request Information (Hansen)

13182886

SR # 13182886

Request Type	TRACC - Roads - Accidents/Claims
Request Date	07/07/2015 19:30
Taken By	112920-0
Incident Date	
Priority	-
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS
Project	-
Address	RED HILL VALLEY PKY / BARTON ST E HAMILTON
Location	
Additional Information	Quantum has been called and clean-up has taken place on July 07/2015 Paper work done by Jay Uhelak.

Area	WARD4-5
Sub-area	
District	
Map #	
Reference #	
Source	
Last Modified By	rspagnuolo
Last Modified Date Time	12/07/2015 13:10:02
Reviewed By	
Reviewed Date	

Inspection

Inspector	083540-0	Severity	1
Scheduled	07/07/2015 19:32	Due By	
Started		Due By	
Completed		Due By	
Resolved	07/07/2015 13:09	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller — Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
FIRE			

EMAIL

Call Date: 07/07/2015 07:30 pm — Taken By: 112920-0

Customer Comments:
FLUID IN 2 LOCATIONS
N/B EXIT TO KING ST AND N/B UNDER THE MOUNT ALBION BRIDGE
F15-021881

Logs

Service Request Information (Hansen)

Hamilton

13187948

SR #	**13187948**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	10/07/2015 08:05	**District**	
Taken By	121849-0	**Map #**	
Incident Date		**Reference #**	
Priority	-	**Source**	
Responsibility	TRAD - ROADS AFTER HOURS DAYS	Last Modified By	cspiak
Project	-	Last Modified Date Time	17/03/2017 15:02:53
Address	RED HILL VALLEY PKY HAMILTON	Reviewed By	
Location	POLICE 15-653201- DEBRIS CLEAN UP @ MUD	Reviewed Date	
Additional Information			

Inspection

Inspector			Severity	1
Scheduled		**Due By**		
Started		**Due By**		
Completed		**Due By**		
Resolved	17/03/2017 15:02	**Due By**		
Resolution	TRPS - PROBLEM SOLVED			

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
		EMAIL	

Call Date: 10/07/2015 08:05 am **Taken By:** 121849-0

Customer Comments

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 3:02:53PM	AGENCY06	Assume complete - cspiak

Hamilton

Service Request Information (Hansen)

13213732

SR #	**13213732**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	24/07/2015 04:39	**District**	
Taken By	115417-0	**Map #**	
Incident Date		**Reference #**	
		Source	
Priority	-	Last Modified By	pmaffei
Responsibility	TRAN - ROADS AFTER HOURS NIGHTS	Last Modified Date Time	26/07/2015 5:36:52
		Reviewed By	
Project	-	Reviewed Date	
Address	RED HILL VALLEY PKY HAMILTON		
Location	NORTHBOUND THEN SOUTH OF GREENHILL		
Additional Information	Duplicate work order		

Inspection

Inspector	121999-0			Severity	1
Scheduled	24/07/2015 04:41	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	26/07/2015 05:33	**Due By**			
Resolution	CSDUP - DUPLICATE SERVICE REQUEST				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			
		EMAIL	

Call Date: 24/07/2015 04:39 am **Taken By:** 115417-0

Customer Comments DEBRIS CLEAN UP AND GUARDRAIL DAMAGE - INCIDENT # 665 054

Logs

Hamilton

Service Request Information (Hansen)

13229617

SR # **13229617**

Request Type	TRACC - Roads - Accidents/Claims	**Area**	WARD4-5
Request Date	03/08/2015 07:34	**Sub-area**	
Taken By	119206-0	**District**	
Incident Date		**Map #**	
Priority	EMRG - Emergency	**Reference #**	
Responsibility	TRAD - ROADS AFTER HOURS DAYS	**Source**	
Project	-	Last Modified By	rdelconte
Address	RED HILL VALLEY PKY HAMILTON	Last Modified Date Time	03/08/2015 11:39:51
Location	north bound lanes on red hill - exit on king, incident #673606	Reviewed By	
Additional Information		Reviewed Date	

Inspection

Inspector	021455-0			Severity	1
Scheduled	03/08/2015 07:38	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	03/08/2015 11:33	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
hamilton police			
		EMAIL	

Call Date: 03/08/2015 07:34 am **Taken By:** 119206-0

Customer Comments dispatched to rob delconte @ 7:36am - Accident scene cleaned up by Quantum Murray Emergency Response and City Force (Rick Oshanek)

Logs

Service Request Information (Hansen)

Hamilton

13232591

SR # 13232591

Request Type TRACC - Roads - Accidents/Claims

Request Date 04/08/2015 17:18

Taken By 113451-0

Incident Date

Priority -

Responsibility TRAA - ROADS AFTER HOURS AFTERNOONS

Project -

Address RED HILL VALLEY PKY / BARTON ST E HAMILTON

Location

Additional Information We checked this location N/B and S/B twice and did not find anything on August 08/ 2015. Police left the scene and made more dificult to find it.

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By rspagnuolo

Last Modified Date Time 08/08/2015 10:08:12

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled 04/08/2015 17:23 **Due By**

Started **Due By**

Completed **Due By**

Resolved 04/08/2015 10:08 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Hamilton Police			
		EMAIL	

Call Date: 04/08/2015 05:18 pm **Taken By:** 113451-0

Customer Comments Guardrail damage from MVC. Inc# P15-674694

Logs

Hamilton

Service Request Information (Hansen)

13264029

SR # 13264029

Request Type TRACC - Roads - Accidents/Claims

Request Date 22/08/2015 13:18

Taken By 121849-0

Incident Date

Priority -

Responsibility TRAD - ROADS AFTER HOURS DAYS

Project -

Address RED HILL VALLEY PKY / BARTON ST E HAMILTON

Location Just north of Barton NB lanes, oil spill
police on scene 15-689409

Additional Information Quantum has been called and clean-up has taken place on August , 22 - 2015 paper work done by Chris Marchionda

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By rspagnuolo

Last Modified Date Time 25/08/2015 18:01:30

Reviewed By

Reviewed Date

Inspection

Inspector 083540-0

Severity 1

Scheduled	22/08/2015 13:26	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	22/08/2015 18:01	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller

Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
police			

EMAIL

Call Date: 22/08/2015 01:18 pm **Taken By:** 121849-0

Customer Comments

Logs

Service Request Information (Hansen)

Hamilton

13286067

SR #	**13286067**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	03/09/2015 17:31	**District**	
Taken By	107516-1	**Map #**	
Incident Date		**Reference #**	
		Source	
Priority	EMRG - Emergency	Last Modified By	scapostagno
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Last Modified Date Time	04/09/2015 22:33:37
Project	-	Reviewed By	
		Reviewed Date	
Address	RED HILL VALLEY PKY HAMILTON		
Location	redhill - fluid clean up		
Additional Information			

Inspection

Inspector	013956-0			Severity	1
Scheduled	03/09/2015 17:37	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	04/09/2015 22:33	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
hamilton Police			
		EMAIL	

Call Date: 03/09/2015 05:31 pm **Taken By:** 107516-1

Customer Comments redhill pky north bound at mud street on ramp - Inc # 15 699 699

Logs

Service Request Information (Hansen)

Hamilton

13299214

SR # 13299214

Request Type	TRACC - Roads - Accidents/Claims
Request Date	12/09/2015 00:41
Taken By	120322-0
Incident Date	
Priority	EMRG - Emergency
Responsibility	TRAN - ROADS AFTER HOURS NIGHTS
Project	-
Address	RED HILL VALLEY PKY HAMILTON
Location	accident on the Red Hill Valley Parkway at the King Street exit - guard rail is destroyed - no fluid cleaup but there is debris on the road Police Incident # 15-706600
Additional Information	

Area	WARD4-5
Sub-area	
District	
Map #	
Reference #	
Source	
Last Modified By	cspiak
Last Modified Date Time	17/03/2017 15:18:13
Reviewed By	
Reviewed Date	

Inspection

Inspector	056380-0	Severity	1
Scheduled	12/09/2015 01:38	Due By	
Started		Due By	
Completed		Due By	
Resolved	17/03/2017 15:18	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Hamilton Police			

EMAIL

Call Date: 12/09/2015 12:41 am **Taken By:** 120322-0

Customer Comments Police Incident #15-706600 - guard rail damaged at the location provided due to an accident

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 3:18:14PM	AGENCY06	Assume Complete - cspiak

Hamilton

Service Request Information (Hansen)

13299588

SR # **13299588**

Request Type TRACC - Roads - Accidents/Claims
Request Date 13/09/2015 09:21
Taken By 121073-0
Incident Date
Priority -
Responsibility TRAD - ROADS AFTER HOURS DAYS
Project -
Address RED HILL VALLEY PKY HAMILTON
Location FLUIDS - NORTH BOUND LANES - NORTH OF GREENHILL
Additional Information Quantum has been called and clean-up has taken place on September , 13 / 2015 , Paper work done by Mike Defazio and Chris Marchionda

Area WARD4-5
Sub-area
District
Map #
Reference #
Source
Last Modified By rspagnuolo
Last Modified Date Time 14/09/2015 22:53:09
Reviewed By
Reviewed Date

Inspection

Inspector 083540-0
Severity 1

Scheduled	13/09/2015 09:53	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	13/09/2015 22:51	**Due By**	

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE - 707493			

EMAIL

Call Date: 13/09/2015 09:21 am **Taken By:** 121073-0

Customer Comments

Logs

Hamilton

Service Request Information (Hansen)

13304961

SR #	**13304961**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	16/09/2015 08:11	**District**	
Taken By	120322-0	**Map #**	
Incident Date		**Reference #**	
		Source	
Priority	EMRG - Emergency	Last Modified By	cagallant
Responsibility	TRND - ROADS NORTH	Last Modified Date Time	09/02/2017 11:58:06
Project	-	Reviewed By	
		Reviewed Date	

Address RED HILL VALLEY PKY HAMILTON

Location on the Red Hill Valley Pky - just north of Stone Church Rd. in the N/B lane

Additional Information

Inspection

Inspector	105099-0	Severity	1
Scheduled	16/09/2015 08:19	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	09/02/2017 11:58	**Due By**	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Hamilton Police			

EMAIL

Call Date: 16/09/2015 08:11 am **Taken By:** 120322-0

Customer Comments Police Incident # 709691 - as per Hamilton Police fluid cleanup is required due to an MVC at the location provided

Logs

Hamilton

Service Request Information (Hansen)

13311612

SR # **13311612**

Request Type	TRACC - Roads - Accidents/Claims
Request Date	19/09/2015 16:17
Taken By	121475-0
Incident Date	
Priority	-
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS
Project	-
Address	RED HILL VALLEY PKY HAMILTON
Location	north bound Red Hill Parkway just north of Greenhill- fluid clean up - also barrier has been struck on left side
Additional Information	barrier was actually on the right side

Area	WARD4-5
Sub-area	
District	
Map #	
Reference #	
Source	
Last Modified By	amiller
Last Modified Date Time	19/09/2015 20:04:36
Reviewed By	
Reviewed Date	

Inspection

Inspector	013956-0	Severity	1
Scheduled	19/09/2015 16:20	Due By	
Started		Due By	
Completed		Due By	
Resolved	19/09/2015 17:55	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
police			

EMAIL

Call Date: 19/09/2015 04:17 pm Taken By: 121475-0

Customer Comments P15-712573

Logs

Hamilton

Service Request Information (Hansen)

13329834

SR # 13329834

Request Type	TRACC - Roads - Accidents/Claims	**Area**	WARD4
Request Date	29/09/2015 22:45	**Sub-area**	
Taken By	112920-0	**District**	
Incident Date		**Map #**	
Priority	-	**Reference #**	
Responsibility	TRAN - ROADS AFTER HOURS NIGHTS	**Source**	
Project	-	Last Modified By	pmaffei
Address	RED HILL VALLEY PKY / PND RED HILL VALLEY WD 4 HAMILTON	Last Modified Date Time	30/09/2015 1:01:47
Location		Reviewed By	
Additional Information	Quantum called for fluid clean-up	Reviewed Date	

Inspection

Inspector 056380-0 Severity 1

Scheduled	29/09/2015 22:46	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	30/09/2015 01:01	**Due By**	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			

EMAIL

Call Date: 29/09/2015 10:45 pm **Taken By:** 112920-0

Customer Comments FLUID FROM MVC...INC #P15-720977
S/B BETWEEN STONE CHURCH AND MUD

Logs

Hamilton

Service Request Information (Hansen)

13336472

SR # 13336472

Request Type	TRACC - Roads - Accidents/Claims	**Area**	WARD4-5
Request Date	03/10/2015 17:03	**Sub-area**	
Taken By	122088-0	**District**	
Incident Date		**Map #**	
Priority	-	**Reference #**	
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	**Source**	
Project	-	Last Modified By	scapostagno
		Last Modified Date Time	03/10/2015 22:15:22
		Reviewed By	
		Reviewed Date	

Address RED HILL VALLEY PKY HAMILTON

Location TIGER TAIL KNOCKED -TOWARDS STONE CHURCH - SOUTHBOUND RAMP - STONE AND DEBRIS CLEAN UP

Additional Information

Inspection

Inspector 013956-0 Severity 1

Scheduled	03/10/2015 17:07	**Due By**	
Started		**Due By**	
Completed		**Due By**	
Resolved	03/10/2015 22:15	**Due By**	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			
		EMAIL	

Call Date: 03/10/2015 05:03 pm **Taken By:** 122088-0

Customer Comments P15-723957
Hamilton Police called at 1742 hrs advising that crew on site unable to advise that fluid clean

Logs

Hamilton

Service Request Information (Hansen)

13336571

SR # 13336571

Area WARD4-5
Sub-area
District
Map #
Reference #
Source

Request Type TRACC - Roads - Accidents/Claims
Request Date 04/10/2015 09:52
Taken By 122088-0
Incident Date
Priority -
Responsibility TRND - ROADS NORTH
Project -
Address RED HILL VALLEY PKY HAMILTON
Location Damage to guardrail - south of king, near northbound lane - per police not an emergency
Additional Information 2 issues: Damage to guardrail - p15-724345, damage to grass - same location p15-724324
Per police neither are emergency so not assigning

Last Modified By cagallant
Last Modified Date Time 09/02/2017 12:10:24
Reviewed By
Reviewed Date

Inspection

Inspector
Severity 1

Scheduled **Due By**
Started **Due By**
Completed **Due By**
Resolved 09/02/2017 12:10 **Due By**
Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
police			

EMAIL

Call Date: 04/10/2015 09:52 am **Taken By:** 122088-0

Customer Comments p15-724345

Logs

Service Request Information (Hansen)

Hamilton

13345588

SR #	**13345588**	**Area**	WARD4-5
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	09/10/2015 08:19	**District**	
Taken By	113584-0	**Map #**	
Incident Date		**Reference #**	
		Source	
Priority	EMRG - Emergency	Last Modified By	cagallant
Responsibility	TRAD - ROADS AFTER HOURS DAYS	Last Modified Date Time	24/02/2017 16:15:45
Project	-	Reviewed By	
		Reviewed Date	
Address	RED HILL VALLEY PKY HAMILTON		
Location	King St E-between Greenhill &Mount Albion		
Additional Information			

Inspection

Inspector	105099-0			Severity	1
Scheduled	09/10/2015 08:32	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	24/02/2017 16:15	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
police			
		EMAIL	

Call Date: 09/10/2015 08:19 am **Taken By:** 113584-0

Customer Comments NB--MVA--incident # 728030 badge # 30--absorbant & debris
Fire Incident #F15-033138

Logs

Hamilton

Service Request Information (Hansen)

13355077

SR # 13355077

Request Type TRACC - Roads - Accidents/Claims

Request Date 16/10/2015 01:13

Taken By 115417-0

Incident Date

Priority -

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location NORTHBOUND -NORTH OF MUD ON RAMP TO REDHILL

Additional Information

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By cspiak

Last Modified Date Time 17/03/2017 14:54:04

Reviewed By

Reviewed Date

Inspection

Inspector 056380-0

Severity 1

Scheduled 16/10/2015 01:14 **Due By**

Started **Due By**

Completed **Due By**

Resolved 17/03/2017 14:53 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
HAMILTON POLICE			

EMAIL

Call Date: 16/10/2015 01:13 am **Taken By:** 115417-0

Customer Comments DEBRIS AND FLUID CLEAN UP FROM MVC - INCIDENT # 733 247

Logs

Log Type and Description	Start Date Time	Started By	Comments
TWCS - STAFF COMMENTS	3/17/2017 2:54:04PM	AGENCY06	Assumed complete - cspiak

Hamilton

Service Request Information (Hansen)

13363127

SR # 13363127

Request Type	TRACC - Roads - Accidents/Claims
Request Date	20/10/2015 23:40
Taken By	112920-0
Incident Date	
Priority	-
Responsibility	TRAN - ROADS AFTER HOURS NIGHTS
Project	-
Address	RED HILL VALLEY PKY HAMILTON
Location	
Additional Information	Approx 50' of guardrail damaged from MVA. Area cleaned up by the time we arrived. Cones put down over affected area. Road was damp

Area	WARD4-5
Sub-area	
District	
Map #	
Reference #	
Source	
Last Modified By	pmaffei
Last Modified Date Time	21/10/2015 3:54:58
Reviewed By	
Reviewed Date	

Inspection

Inspector	121999-0		
Scheduled	20/10/2015 23:42	Due By	
Started		Due By	
Completed		Due By	
Resolved	21/10/2015 03:54	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Severity 1

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			

EMAIL

Call Date: 20/10/2015 11:40 pm **Taken By:** 112920-0

Customer Comments GUARD RAIL HIT - N/B UNDER MT ALBION OVERPASS. INC #P15-736921

Logs

Service Request Information (Hansen)

Hamilton

13369554

SR #	**13369554**	**Area**	WARD4
Request Type	TRACC - Roads - Accidents/Claims	**Sub-area**	
Request Date	24/10/2015 17:01	**District**	
Taken By	122685-0	**Map #**	
Incident Date		**Reference #**	
		Source	
Priority	-	Last Modified By	scapostagno
		Last Modified Date Time	24/10/2015 21:56:30
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS	Reviewed By	
Project	-	Reviewed Date	
Address	RED HILL VALLEY PKY / PND RED HILL VALLEY WD 4 HAMILTON		
Location	south bound lanes at Barton Street		
Additional Information			

Inspection

Inspector	013956-0			Severity	1
Scheduled	24/10/2015 17:08	**Due By**			
Started		**Due By**			
Completed		**Due By**			
Resolved	24/10/2015 21:56	**Due By**			
Resolution	TRPS - PROBLEM SOLVED				

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
Police			
		EMAIL	

Call Date: 24/10/2015 05:01 pm **Taken By:** 122685-0

Customer Comments Police Incident 15-739768 - three major mvas - guard rail damage - lots of debris from accidents -request for debris clean up and sweep of area

Logs

Hamilton

Service Request Information (Hansen)

13369565

SR # 13369565

Request Type	TRACC - Roads - Accidents/Claims
Request Date	24/10/2015 18:16
Taken By	121475-0
Incident Date	
Priority	-
Responsibility	TRAA - ROADS AFTER HOURS AFTERNOONS
Project	-
Address	RED HILL VALLEY PKY / BARTON ST E HAMILTON
Location	south of mud st bend in north bound lanes - fluid clean up
Additional Information	

Area	WARD4-5
Sub-area	
District	
Map #	
Reference #	
Source	
Last Modified By	scapostagno
Last Modified Date Time	24/10/2015 21:54:37
Reviewed By	
Reviewed Date	

Inspection

Inspector 013956-0

Severity 1

Scheduled	24/10/2015 18:18	Due By	
Started		Due By	
Completed		Due By	
Resolved	24/10/2015 21:54	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Contacts Information

Primary Caller

Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
police			

EMAIL

Call Date: 24/10/2015 06:16 pm

Taken By: 121475-0

Customer Comments P15-739760

Logs

Service Request Information (Hansen)

Hamilton

13369629

SR # 13369629

Request Type	TRACC - Roads - Accidents/Claims
Request Date	25/10/2015 02:50
Taken By	121073-0
Incident Date	
Priority	-
Responsibility	TRAN - ROADS AFTER HOURS NIGHTS
Project	-
Address	RED HILL VALLEY PKY HAMILTON
Location	

Area	WARD4-5
Sub-area	
District	
Map #	
Reference #	
Source	
Last Modified By	pmaffei
Last Modified Date Time	11/11/2015 2:29:17
Reviewed By	
Reviewed Date	

Additional Information We had a single vehicle MVA on the N/B RHVP last night at 2:50am. There was damage to the guardrail in two locations (see images for reference)

No Quantum
Road conditions were damp
No injuries were reported
P15 740 111
Hansen # 13369629

Inspection

Inspector	121999-0		
Scheduled	25/10/2015 02:51	Due By	
Started		Due By	
Completed		Due By	
Resolved	11/11/2015 02:29	Due By	
Resolution	TRPS - PROBLEM SOLVED		

Severity 1

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE - 740111			

EMAIL

Call Date: 25/10/2015 02:50 am Taken By: 121073-0

Customer Comments CAR VERSES GUARD RAIL - NORTH BOUND LANES - SOUTH OF KING ST RAMP

Logs

Hamilton

Service Request Information (Hansen)

13376453

SR # 13376453

Request Type TRACC - Roads - Accidents/Claims

Request Date 28/10/2015 22:57

Taken By 112920-0

Incident Date

Priority -

Responsibility TRAN - ROADS AFTER HOURS NIGHTS

Project -

Address RED HILL VALLEY PKY HAMILTON

Location

Additional Information Cones put down at site of damage. No police on site to provide any details

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By pmaffei

Last Modified Date Time 11/11/2015 2:43:01

Reviewed By

Reviewed Date

Inspection

Inspector 121999-0

Severity 1

Scheduled 28/10/2015 23:10 — **Due By**

Started — **Due By**

Completed — **Due By**

Resolved 11/11/2015 02:42 — **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
POLICE			

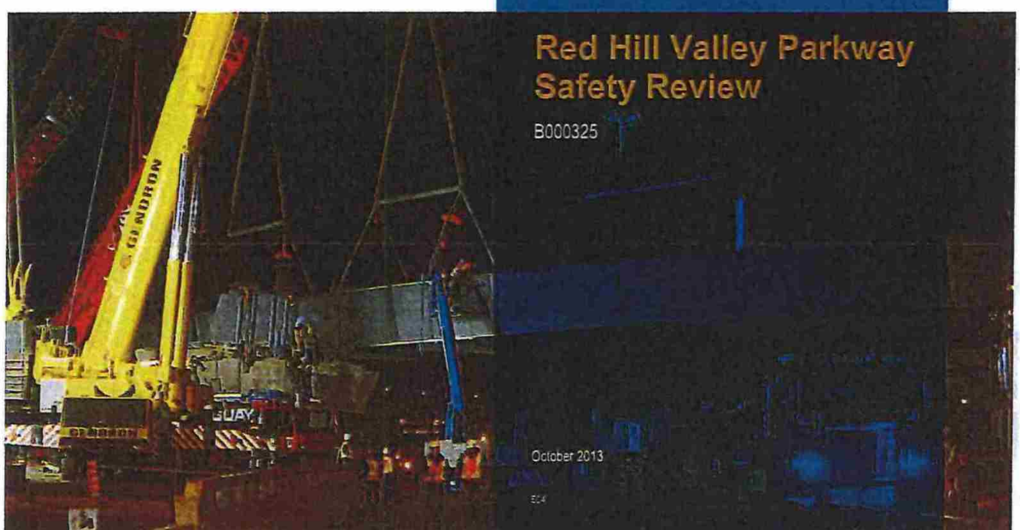
EMAIL

Call Date: 28/10/2015 10:57 pm **Taken By:** 112920-0

Customer Comments BETWEEN KING AND QUEENSTON - GUARD RAIL DAMAGE FROM MVC...INC #P15-742844

Logs

City of Hamilton



Red Hill Valley Parkway Safety Review

B000325

October 2013

CIMA+

Partners in excellence

Project Team

Prepared By:

Alex Nolet, P.Eng.

Ben Robertson, C.E.T.

Giovani Bottesini, E.I.T.

Maurice Masliah, Ph.D.

Brian Applebee, C.E.T., TOPS

Reviewed By:

Ali Hadayeghi, P.Eng., Ph.D.

Brian Malone, P.Eng., PTOE

B000325

Executive Summary

The Red Hill Valley Parkway (RHVP) has a long history in Hamilton. Because of the unique area through which the RHVP traverses, and because of the costs associated with building a roadway on the escarpment, the City was faced with a lengthy planning, design and construction schedule. Furthermore, following recommencement of the project after one significant period of stoppage, the City identified several design refinements to the original alignment plan. These refinements included a general reducing in the number of lanes on the through section of RHVP as well as restricting illumination to ramp terminals and on/off ramps. In 2007 the RHVP was opened to traffic.

Since then Council has received residents' input relating primarily to illumination around the Mud Street interchange, the visibility of signage and pavement markings and a need to review potential devices that would assist motorists in safely traversing the roadway. As the result, Council put forward a motion to investigate a section of the RHVP which led to the commencement of this safety and operational study. The objectives of this study are to review a portion of the RHVP between Dartnall Road and Greenhill Road (as illustrated in **Figure 1**) to determine the safety performance of the roadway since opening in 2007 and recommend viable potential measures that could be implemented to increase the safety performance and/or drivers' sense of security.

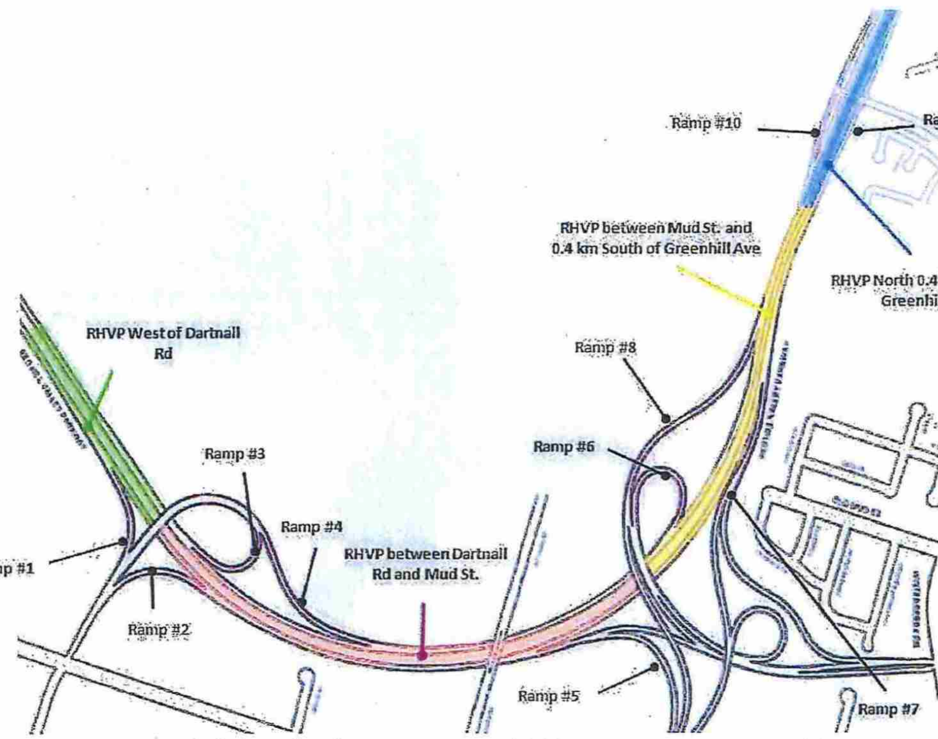


Figure 1 - Study Area

The scope of this study included the review, analysis, development and assessment of the following key aspects:

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- Review and analysis of traffic volumes, speed and collisions;
- Review and analysis of signs and markings;
- Review of human factors (and road user security);
- Review of roadside safety and hardware;
- Review of illumination in specific areas only (i.e. not throughout study area);
- Development of a long-list of viable potential countermeasures;
- Assessment of countermeasures using collision modification factors where available;
- Assessment of cost-benefit of countermeasures; and
- Recommendation of viable countermeasures.

The findings of the study indicated that, overall, the RHVP is operating safely when compared with other roads with similar characteristics. However, several locations were identified as performing worse than would be expected, and for those locations, various countermeasures were developed and scrutinized. This led to numerous recommendations for improvement as summarized in the following tables.

Each of the tables has a recommendation for timing, which are abbreviated as:

- Short Term (ST) = 0 – 5 years;
- Medium Term (MT) = 5 – 10 years; and
- Long Term (LT) = 10+ years.

Table 1 summarizes the overall study area countermeasures. These are countermeasures that apply to the study area in general and are not specifically related to any one section.

Table 1 - Overall Study Area Countermeasures

Countermeasure	B/C Ratio	Cost	Timing
Friction Testing	n/a	$10,000	ST
PRPM or	3.29	$75,000	ST
Inverted Profile Markings	n/a	n/a*	ST
Wide Markings	3.39	$40,000	ST
Slippery When Wet Signs	n/a	$5,000	ST
Enforcement of Travel Speeds	n/a	n/a	ST

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Countermeasure	B/C Ratio	Cost	Timing
Trailblazer Signage	n/a	$2,000	ST
Remove Lane Exit Signs	n/a	$1,000	ST
Total Costs		$133k	

Table 2 summarizes the countermeasures that are related to the mainline segments of the RHVP.

Table 2 - Road Segment Countermeasures

Name	Road Segment	Collisions	Field	Countermeasure	B/C Ratio	Cost	Term
West of Dartnall	Dartnall 1 & 2	None	No major findings	n/a	n/a	n/a	n/a
Between Dartnall & Mud	Dartnall 3, 4 & 5	48% SMV	Potentially restricted sightlines for merging traffic from Dartnall onto NB RHVP	Extend solid white line from gore	n/a	$500	ST
			Exit information sign partially obscured NB RHVP	Remove Deer Warning sign	n/a	$500	ST
			Change in alignment in SB direction	Alter SB alignment with pavement markings & alteration to rumble strips & possibly to the shoulder	n/a	$4,000*	ST
Between Mud & Greenhill	Mud 1, 2 & 3	60% SMV 50% non-daylight	Uneven terrain in front of guiderail NB	Flatten terrain or raise guiderail NB	n/a	n/a**	ST

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Name	Road Segment	Collisions	Field	Countermeasure	B/C Ratio	Cost	Term
	Mud 4, 5 & 6	• **Exp. >. Pred. @ Mud 4** • Primarily SMV • High proportion of non-daylight & wet surface	• Closely spaced & obscured signage at critical decision points SB	• Relocate "ENGINE BRAKES" sign NB	• n/a	• $500	• ST
			• Potentially confusing "keep right" sign NB	• Remove "Slower Traffic" sign SB	• n/a	• $500	• ST
			• Closely spaced & obscured signage at critical decision points NB	• Place "Object Marker" sign on same post as "Exit" sign SB	• n/a	• $500	• ST
	Greenhill 1 to 4	• None	• No major findings	• n/a	• n/a	• n/a	• n/a
	Total Costs					• $6,500***	

* Cost is for pavement markings only. Other potential required works could increase cost substantially
**It is expected that this countermeasure could be completed by City forces
***Not including other potential works associated with the alignment adjustment

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Table 3 summarizes the countermeasures that are related to the ramps at the interchanges within the study area.

Table 3 - Ramp Countermeasures

Name	Ramp	Collisions	Field	Countermeasure	B/C Ratio	Cost	Term
Dartnall Int.	Ramp 1 & 2	n/a	Culvert and drop-off within deflection area of approach eccentric loader end treatment (Ramp 2)	End guiderail and change end treatment	n/a	$11,000	ST
Dartnall Int.	Ramp 3	n/a	No major findings	n/a	n/a	n/a	n/a
Dartnall Int.	Ramp 4	n/a	No major findings	n/a	n/a	n/a	n/a
Mud Int.	Ramp 5		Lane ends within curve	Restripe to one lane for each ramp	n/a	$8,000	MT
Mud Int.	Ramp 6	Exp. > Pred.; 65% of all ramp collisions; High proportion & frequency of SMV, non-daylight & wet surface	TAC illumination warrant justified	Install lighting on ramp	3.78	$275,000	ST
			Closely spaced / eclipsing signage at diverge point; Evidence of lane departures	Install high-friction pavement approaching and through curve	2.32	$93,000	ST
				Install progressively larger chevrons	n/a	$4,000	ST
				Install pavement marking text	n/a	$1,500	ST
				Install dynamic / variable speed warning sign	n/a	$7,000	ST

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Name	Ramp	Collisions	Field	Countermeasure	B/C Ratio	Cost	Term
				Install flashing amber beacons on signs	n/a	$3,000	ST
				Relocate signs	n/a	$2,000	ST
	Ramp 7a 7 7b	Exp. > Pred. 80% of collisions SMV High proportion of non-daylight & wet surface	Closely spaced & back dropped signage at diverge	Relocate signs	n/a	$2,000	ST
			Inappropriate merge sign	Replace merge sign with Wa-123 Lane Ends sign	n/a	$500	ST
	Ramp 8	Exp. > Pred., however very low # of collisions	Size of information signs	Replace road name information signs with advance diagrammatic sign	n/a	$5,000	ST
			Inconsistent curve warning signs	Install consistent curve warning signage	n/a	1,000	ST
Greenhill Int.	Ramp 9	Exp. > Pred., however very low # of collisions	No major findings	n/a	n/a	n/a	n/a
	Ramp 10	Exp. > Pred., however very low # of collisions	No major findings	n/a	n/a	n/a	n/a
	Total Costs					ST = $405,000 MT = $8,000	

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1. Introduction and Background

The Red Hill Valley Parkway (RHVP) has a long history in Hamilton. In December of 1982, the original Environmental Assessment (EA) documents were filed by the former Region of Hamilton-Wentworth that outlined the need, scope and timing for the expansion of the Regional road network. The EA identified that a roadway connecting Highway 403 in Ancaster to the QEW in east Hamilton was required. The original design for the roadway was completed in 1985, and the EA was approved by the Province in 1987. A subsequent Preliminary Design Report for RHVP was completed in January of 1990.

Construction of the Valley portion of the Parkway was begun in the early 1990s. Some aspects of funding, but not approvals, were halted and the project restarted in the mid-2000's. Construction of the Lincoln Alexander Parkway portion of the roadway went ahead and was completed in 1997, extending from Highway 403 to Dartnall Road.

In the early 1990's, the City entered into discussions with the Provincial government on how to further reduce impacts to the environment within the Valley section of the road. As a result of these discussions, in 1996, the City requested from the Province that they be allowed to undertake changes to the original designs and undertake a new EA. The Province approved this request in 1997 and work on the design changes and the new EA were begun and the City undertook an Impact Assessment and Design Process (IADP).

In 1999 the project was subject to panel hearing under the Canadian Environmental Assessment Act (CEAA). Construction in the Valley was placed on hold until 2002 when issues were resolved. In 2003 the design changes and the IADP were completed and construction on the Parkway recommenced. In 2007, the Red Hill Valley Parkway was opened to traffic and has been in operation since.

This safety study was commenced by the City following a motion put forward by City Council to investigate a section of the RHVP. The motion came as a result of residents' input relating primarily to illumination around the Mud Street interchange, the visibility of signage and pavement markings and a need to review potential devices that would assist motorists in safely traversing the roadway. The City proactively decided to undertake a safety and operational review of a portion of the parkway to examine the issues put forward by the motion as well as other aspects.

2. Study Objectives and Limitations

2.1 Study Objectives

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The objectives of this study are to review a portion of the RHVP between Dartnall Road and Greenhill Road to determine the safety performance of the roadway since opening in 2007 and recommend viable potential measures that could be implemented to increase the safety performance and/or drivers' sense of security.

2.2 Study Limitations

When conducting road safety studies two generic areas of review are roadway geometry and design and illumination. However, as part of the Parkway's long history, the road design has been analyzed and refined several times, up to and including the design changes put forward in 2003, which formed part of the critical environmental agreements and approvals have been made.

Design choices on the facility were intimately linked to approvals. Reference materials note; "The sole reason for making design changes was to reduce environmental impacts."[1] The Valley section of the Parkway traverses the Niagara Escarpment, a UNESCO World Biosphere Reserve, designated for its unique landform characteristics and the presence of a provincial land use plan to guide development in its area. It is one of only 16 biosphere reserves in Canada, and is part of a network of 598 in 117 countries. It is a rich mosaic of forests, farms, recreation areas, scenic views, cliffs, streams, wetlands, rolling hills, waterfalls, mineral resources, wildlife habitats, historic sites, villages, towns and cities. The Escarpment is home to more than 300 bird species, 53 mammals, 36 reptiles and amphibians, 90 fish and 100 varieties of special interest flora including 37 types of wild orchids. The Escarpment is home to almost 40% of Ontario's rare flora.[2]

Because of this unique area, and because of the costs associated with building a roadway on the escarpment, the City identified several design refinements to the alignment of the roadway within the Valley. These refinements, "...consider environmental benefits, driver safety, and construction cost..."[3] and include the following specific to this review:

- Reducing through lanes from 3 northbound and 3 southbound to 2 northbound (with a truck climbing lane from Greenhill Avenue to Dartnall Road) and 2 southbound to reduce the footprint of the road and increase potential areas for restoration and reforestation;
- Redesigning the interchange with Greenhill Avenue (from a loop interchange to a diamond interchange) to reduce the required area (which protects specialized dry meadow, marsh and Escarpment habitats) and reduce the speed of vehicles exiting and entering the Parkway; and
- Restricting illumination to intersections and on/off ramps[4]

Through the City's IADP, these design changes were well scrutinized and the following[5] was found:

- The four-lane facility could safety accommodate 2021 projected traffic volumes;
- The Parkway could operate at the 90 km/h posted speed during peak hours in the year 2021;

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[1] Red Hill Valley Impact and Design Process, City of Hamilton, Page 3
[2] http://www.escarpment.org/about/overview/index.php, Accessed July 2013
[3] Red Hill Valley Impact and Design Process, City of Hamilton, Page 6
[4] Red Hill Valley Project Public Consultation Report, March 2003, Lura Consulting, Page 136
[5] Red Hill Valley Impact and Design Process, City of Hamilton, Page 106

- Interchanges at Mud Street and Greenhill Avenue would operate within an acceptable level of service;
- The design of the Parkway has taken into consideration the posted 90 km/h speed;
- Redesigns of the interchanges has considered the level of service; and
- The Parkway will operate safely.

Given the extensive history of the Parkway, the unique geography that it traverses, the many design refinements and assessments undertaken over the years, the many environmental agreements and approvals required, and the "urban expressway" nature of the design, it was determined that a review of the fundamental roadway design geometry of the roadway and illumination throughout the study area was beyond the scope of this study.

3. Scope and Study Area

3.1 Study Scope

The scope of this study included the review, analysis, development and assessment of the following key aspects:

- Review and analysis of traffic volumes, speed and collisions;
- Review and analysis of signs and markings;
- Review of human factors (and road user security);
- Review of roadside safety and hardware;
- Review of illumination in specific areas only (i.e. not throughout study area);
- Development of a long-list of viable potential countermeasures;
- Assessment of countermeasures using collision modification factors where available;
- Assessment of cost-benefit of countermeasures; and
- Recommendation of viable countermeasures.

3.2 Study Area

The study area included the RHVP between Dartnall Road and Greenhill Avenue as well as the Mud Street/Stone Church Road intersection. **Figure 2** illustrates the basic study area.

Figure 2 - Study Area

4. Safety Review

The safety review undertaken for the RHVP included several tasks, including both qualitative and quantitative analyses. These included a quantitative collision and traffic operational analysis and qualitative field review including a review of human factors.

4.1 Collision Analysis

The purpose of the collision analysis is to identify locations that have a higher than average number of collisions and to identify locations where the proportion of different collision types are unusually high. CIMA conducted the analysis using two different methods. The first analysis used strictly the historical observed number of collisions. Segmentation of the collision data was performed at a high level where each ramp was treated separately while the mainline was divided by sections in between interchanges. The second analysis involved the use of analytical tool known as the Enhanced Interchange Safety Analysis Tool (ISATe) which required a further, more detailed segmentation. Therefore, the collision data was segmented a second time to meet the data input requirements of ISATe.

4.1.1 Methodology

Collision data were obtained from the City for a five-year period from October 10, 2008 to October 9, 2013. The collisions were provided for ten (10) ramps and a four kilometre stretch of RHVP from Dartnall Road to Greenhill Avenue.

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The identification of collision trends within the study area was performed through a collision data review which considered descriptive statistics of collision conditions and locations. To help summarize collision data and to facilitate the identification of collision patterns, each collision was mapped and assigned to a road element; either a ramp or a mainline segment. The data needed to be segmented into homogeneous sections. A homogeneous section is one where the key characteristics of traffic volume, key geometric design features, and traffic control are unchanged throughout the section. A simple and straightforward segmentation was used in that each ramp was treated separately while the mainline was divided by sections in between interchanges. The various road elements included in the study area are listed in **Table 4** and illustrated in **Figure 3**.

Table 4 – List of Road Elements Included in the Study Area

Ramp Names	Mainline
Ramp #1: Dartnall Rd EB-SB off ramp	RHVP west of Dartnall Rd
Ramp #2: Dartnall Rd NB-EB on ramp	RHVP Dartnall Rd and Mud St.
Ramp #3: Dartnall Rd NB-WB Loop on ramp	RHVP between Mud St. and 0.4 km South of Greenhill Ave
Ramp #4: Dartnall WB off ramp	RHVP North 0.4 km South of Greenhill Ave
Ramp #5: Mud NB-EB off ramp	
Ramp #6: Mud	
Ramp #7: Mud WB-NB on ramp	
Ramp #8: Mud SB-EB off ramp	
Ramp # 9: RHVP NB to Greenhill	
Ramp #10: Greenhill to RHVP SB	

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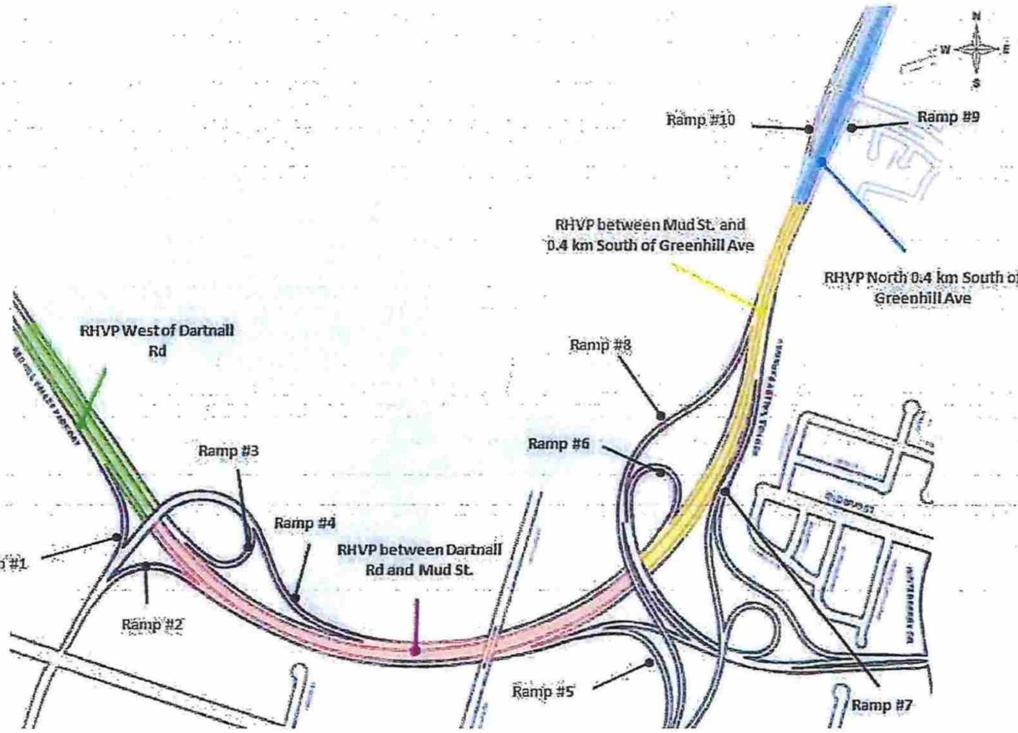

Figure 3 - Road Elements Included in the Study Area

The purpose of this collision analysis is to identify collision types that are over represented at different locations. The collision types that were analyzed included the following factors:

- Collision Severity: property damage only (PDO), non-fatal injury and fatal collisions;
- Collision Impact Type: single-motor vehicle (SMV), side swipe, rear-end, overtaking, head-on, right-turn, pedestrian and other collisions;
- Lighting: daylight and non-daylight; and
- Road Surface: dry, snow/ice, wet and other.

4.1.2 Collision Analysis Results

The study area experienced a total of 174 collisions in the five years period reviewed, of which 62 occurred on ramps and the remaining 112 occurred on mainline segments. The collision distribution is shown in **Table 5.**

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Table 5 - Collision Distribution on Ramps and Mainline Segments.

Road Elements	Length (m)	No. of Total Collisions	Proportion
Ramps			
Ramp #1	230	0	0%
Ramp #2	240	0	0%
Ramp #3	480	1	2%
Ramp #4	660	0	0%
Ramp #5	160	5	8%
Ramp #6	420	40	65%
Ramp #7	810	10	16%
Ramp #8	500	1	2%
Ramp #9	350	4	6%
Ramp #10	270	1	2%
Total (Ramps)	***4,120***	***62***	***100%***
Mainline Segments			
West of Dartnall Rd	510	15	13%
Between Dartnall Rd and Mud St.	1,160	34	30%
Between Mud St. and 0.4 km South of Greenhill Ave	2,130	58	52%
North 0.4 km South of Greenhill Ave	500	5	4%
Total (Mainline)	***4,300***	***112***	***100%***

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During the study period, no collisions were reported on Ramps 1, 2 and 4. Just one collision was reported on Ramps 3, 8 and 10. More than half of all the ramp collisions reported were reported on Ramp 6 (from Mud Street westbound to the Linc westbound).

For mainline, the segment that experienced the highest proportion of collisions (52%) was between Mud Street and 0.4 km South of Greenhill Avenue, which also represents the longest segment with a total length of 2.13 kilometres. The next highest segment was between Dartnall Road and Mud Street which experienced 30% of the mainline collisions.

Breakdown of Collisions

The following collision pie charts for each road element in the study area are provided in this section and document the severity, impact type, lighting and road surface.

COLLISION SEVERITY

Figure 4 provides collision pie charts for each collision severity attribute (PDO, non-fatal injury and fatal).

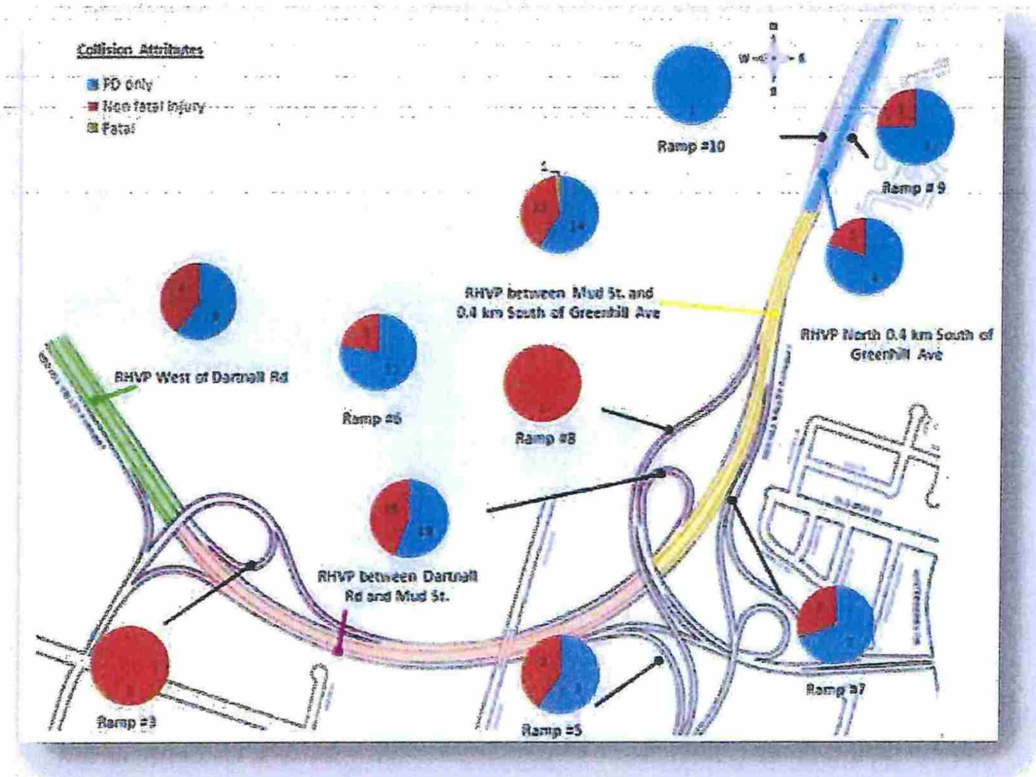

Figure 4 - Collision Pie Charts – Severity

Only one fatal collision occurred during the study period. The fatal collision was observed on the mainline segment of the RHVP between Mud Street and 0.4 km South of Greenhill Avenue.

The overall proportion of non-fatal injury collision within the study area is 36%. For three of the mainline segments, the West of Dartnall Rd, RHVP between Dartnall Rd and Mud Street and RHVP between Mud Street and 0.4 km South of Greenhill Avenue, the proportion of non-fatal injury collision is higher than the study area average, with 40%, 44% and 40% respectively. While the mainline

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segments are all different lengths, the length of the section does not impact the proportion of collision severity. In other words, collisions along these three mainline segments are more likely to be severe than compared to other locations along RHVP.

COLLISION IMPACT TYPE

Figure 5 provides collision pie charts for each collision impact type attribute (single motor vehicle [SMV], side swipe, rear-end, overtaking, head-on, right-turn, pedestrian and other).

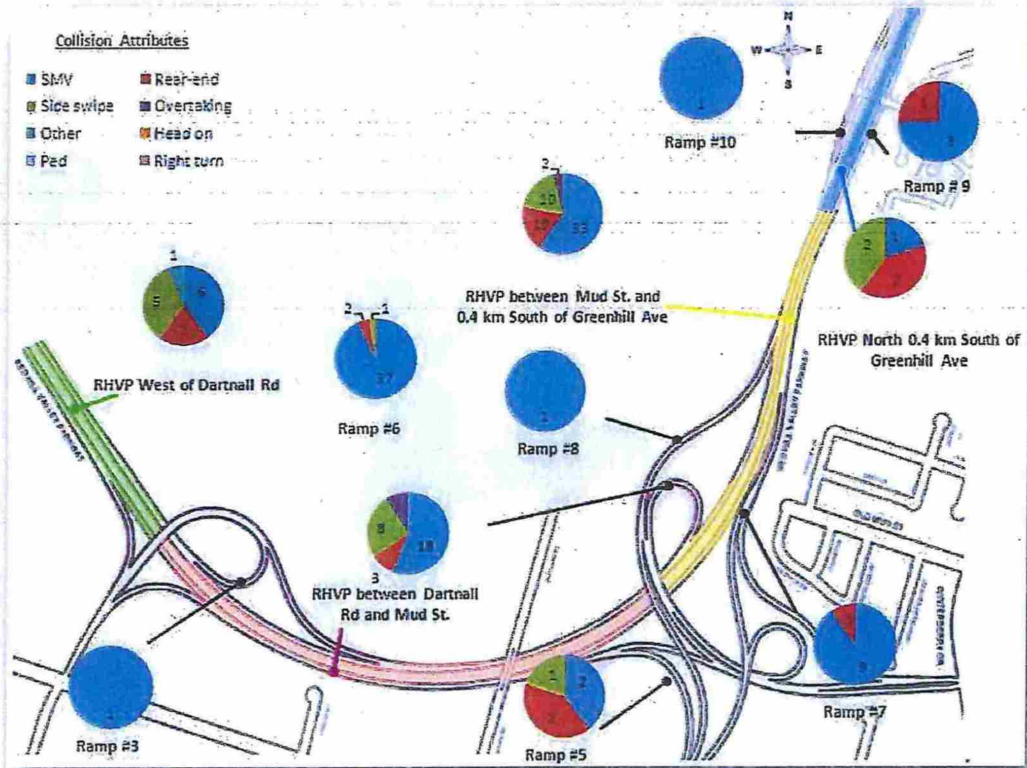

Figure 5 - Collision Pie Charts – Impact Type

The most common impact type observed within the study area is SMV, with an overall proportion of 64%. The proportion of SMV collisions on Ramp 6 is significantly higher than all other locations,

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where more than 92.5% of collisions are SMVs. These findings are notable, especially when compared to the 2004-2011 Provincial average of SMV collisions occurring on ramps[6], which is 57%

LIGHTING

Figure 6 provides collision pie charts for each collision impact type attribute (daylight and non-daylight), where non-daylight includes dusk/dawn as well as dark conditions.

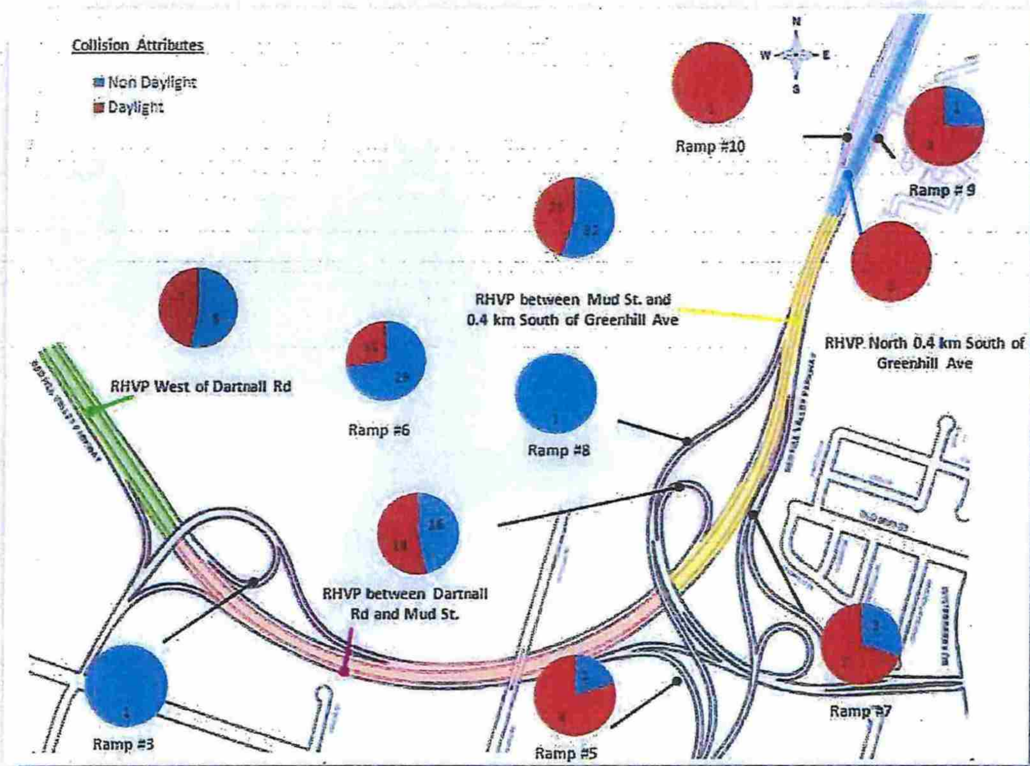

Figure 6 - Collision Pie Charts – Lighting

The study area experienced an atypically high proportion of non-daylight collisions. In fact, according to the 2010 Ontario Road Safety Annual Report (ORSAR)[7], less than 30% of all collisions in Ontario occurred during non-daylight conditions. By comparison, the proportion of non-daylight collisions

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[6] Ministry of Transportation of Ontario SafetyAnalyst project, CIMA. 2013.
[7] Ontario Road Safety Annual Report (ORSAR), Ontario Ministry of Transportation, 2010

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within the study area is 52% which is much higher than the provincial average, and higher than the average on all City of Hamilton roads, which is 36%.[8] The road element within the study area that experienced the highest proportion of non-daylight collisions is Ramp 6, with a proportion of 73%.

ROAD SURFACE

Figure 7 provides the collision pie charts for collision road surface attribute (dry, snow/ice, wet and other).

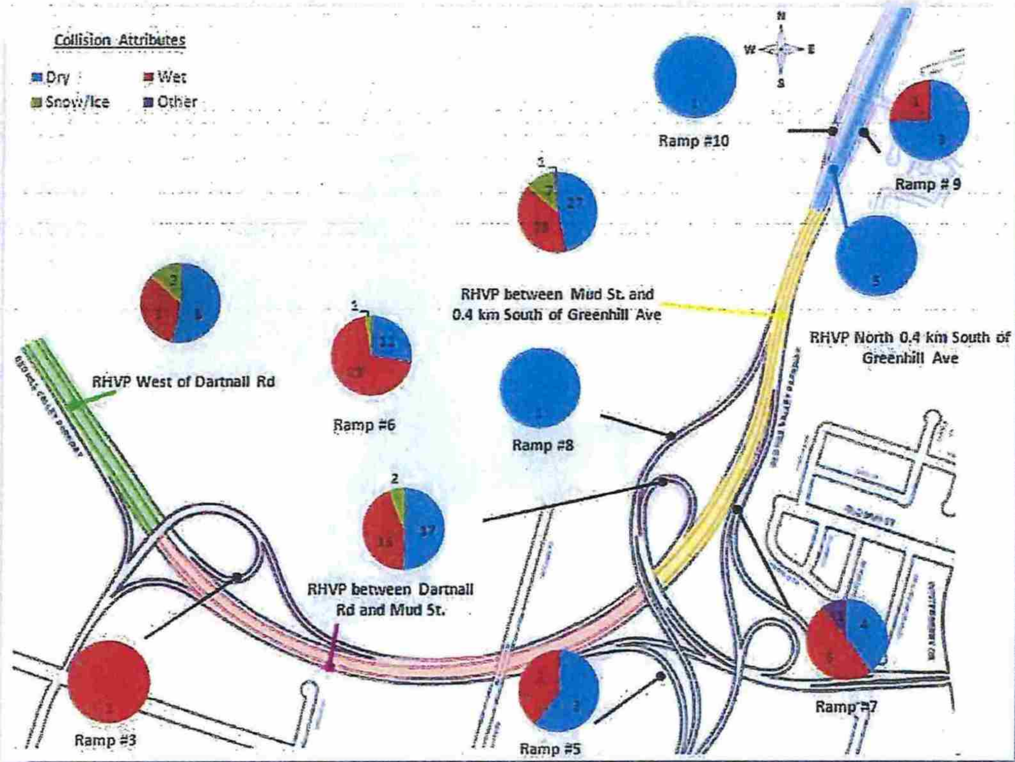

Figure 7 - Collision Pie Charts – Road Surface

The study area overall average of collisions that occurred under wet road surface condition is 46%. When compared to the Provincial average of 17.4%[9] and the City of Hamilton average of 13%[10], the

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[8] 2008-2010 Traffic Safety Status Report, City of Hamilton, 2010
[9] Ontario Road Safety Annual Report (ORSAR), Ontario Ministry of Transportation, 2010

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proportion of collisions under wet road surface is significantly higher. This difference is mainly attributable to Ramp 6 and the mainline segment of RHVP between Mud Street and 0.4 km South of Greenhill Avenue, where the proportions of collisions that occurred under wet road surface conditions are 70% and 40%, respectively.

Findings Summary

The following bullets summarize the most notable findings of the collision analysis:

- Among the ten ramps included in the study area, 65% of the ramp collisions were recorded on Ramp #6;
- The proportion of non-fatal injury collisions for the mainline segments between Dartnall Road and Mud Street and Mud Street and 0.4 km south of Greenhill Avenue is higher than the study area average;
- The most common impact type observed within the study area is SMV, with an overall proportion of 64%;
- The proportion of SMV collisions on Ramp 6 is more than 92.5%;
- The proportion of non-daylight conditions (52%), and the proportion of non-daylight collisions on Ramp 6 (73%) are much greater than the Provincial and City average proportions of collisions which are approximately 30% and 36%, respectively; and
- The proportion of collisions that occurred under wet road surface for Ramp 6 and the mainline segment of RHVP between Mud Street and 0.4 km South of Greenhill Avenue are 70% and 40%, respectively, which is much greater than the Provincial average of 17.4% and the City average of 13%.

4.2 Safety Analysis Using the Enhanced Interchange Safety Analyst Tool (ISATe)

4.2.1 Terminology: Observed, Predicted, and Expected Number of Collisions

The number of collisions that occur at a location is referred to the observed number of collisions. Since collisions have a highly random component, the observed collision data can vary greatly from year to year. If we had 50 years of collision data on a ramp, then the average number of collisions over the 50 years would be a very good estimate of the true safety of the ramp. This would only be the case if it was assumed that nothing changed over the 50 years including traffic volume, drivers (age, education, and experience), vehicles, the characteristics of the ramp itself, and the

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[10] 2008-2010 Traffic Safety Status Report, City of Hamilton, 2010

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environment. Obviously it is not realistic to have available 50 years of collision data at a location and expect that traffic and conditions have not changed. Instead, a jurisdiction can utilize five years of recent collision data, assuming there have been no major geometric changes to calculate a collision average if there are sufficient numbers of sites for which the five year data is available. For example, if there are 50 ramps with similar characteristics along with their corresponding traffic volumes it would be possible to assess 5 years × 50 ramps = 250 years of data which can then be used to calculate an overall average number of collisions.

A Safety Performance Function (SPF) is a mathematical equation which describes the best fit relationship between the number of collisions on a road and the characteristics of the road where the characteristics can include traffic volume, road functional class, and environment type. SPFs are published in the literature or are developed by using all of the data from a jurisdiction to determine the best fit equation. By plugging key information into a SPF, one can then calculate what is referred to as the predicted number of collisions. The predicted number of collisions may be thought of as the average number of collisions of the particular type of entity with that particular traffic volume for a typical location.

The observed number of collisions provides site specific information, whereas the SPF provides overall average information. By combining the information from the observed and predicted number of collisions a better estimate of the true safety of a location can be determined. The empirical Bayes methodology combines observed collision data with the number of collisions predicted for similar sites. The combined number is known as the expected number of collisions. The expected number of collisions combines the observed number of collisions (obtained from the actual data) with the predicted number of collisions (obtained from the SPF for similar sites).

The expected number of collisions is estimated by using the empirical Bayes method to create a weighted combination of the actual number of collisions (obtained from the frequency data) and the predicted number of collisions (obtained from the SPF) as can be seen in **Figure 8**. A list of SPFs and calibration factors is included in **Appendix A**.

The empirical Bayes methodology is also used by the ISATe tool as described in the next section.

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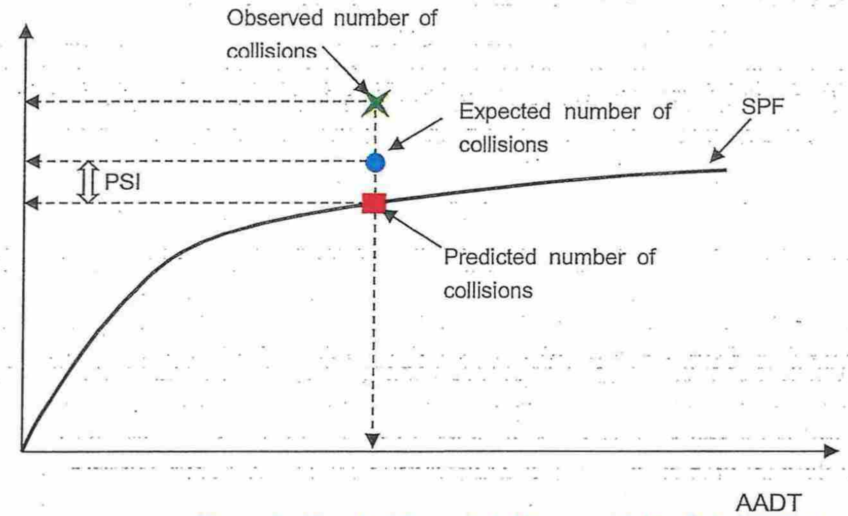

Figure 8 - Visual of Expected, Observed & Predicted Collisions & PSI

4.2.2 Methodology

ISATe[11] is an automated tool for assessing the safety of freeway facilities, including mainline sections and interchanges. This tool is intended to assist designers in making more informed decisions about the level of safety of design alternatives. Three main types of analysis can be performed using ISATe, including:

- Reconstruction Project Prioritization: to estimate the safety performance of a facility by determining its priority for reconstruction;
- System Safety Management: to evaluate the safety performance of several facilities and determine what countermeasures and where to implement them so that the greatest impact on safety is achieved; and
- Economic Analyst: to estimate the cost associated with the expected total number of collisions or to evaluate the safety benefits due to the number of collisions saved after the implementation of a countermeasure.

ISATe incorporates the safety prediction method which is included in Part C of the Highway Safety Manual (HSM). It uses a disaggregate safety evaluation approach. Freeway facilities are

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[11] Bonneson, J. A.; Pratt, M. P. ; Geedipally, S.; Lord, D.; Neuman, T.; Moller, J. A. Enhanced Interchange Safety Analysis Tool: User Manual. National Cooperative Highway Research Program Project 17-45. 2012.

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disaggregated into freeway mainline sections and/or interchanges, and an interchange subsequently disaggregated into ramps, collector-distributor (C-D) roads and crossroad terminals. Therefore, a safety analysis performed using ISATe can include the following basic roadway facility components:

- Freeway sections (with or without speed-change lanes);
- Ramps or C-D roads; and,
- Crossroads ramp terminals.

Each component is further divided into segments or intersections as individual sites. The corresponding safety performance functions (SPFs) and collision modification factors (CMFs) are then used to evaluate the predicted average collision frequency at a site. The disaggregate approach also provides the ability to estimate the impacts on safety (collision frequency, type and severity) of modifying a specific geometric element (shoulder width, presence of a barrier, curve length, curve radius, speed-change lane, etc.).

The following provides a list of the different road characteristics that were to develop the SPFs available ISATe:

- For freeway segments:
  - Site types: freeway segment, ramp-entrance speed-change lane, ramp-exit speed-change lane;
  - Severity: fatal and injury, property damage only;
  - Area type: rural, urban;
  - Freeway through lanes: 4, 6, 8, 10; and
  - Collision type: multiple vehicle, single vehicle.
- For Ramps:
  - Site types: entrance ramp, exit ramp, C-D road;
  - Severity: fatal-and-injury (FI), property-damage-only (PDO);
  - Area type: rural and urban;
  - Ramp through lanes: 1 and 2; and
  - Collision type: multiple vehicle, single vehicle.

The CIMA team obtained all of the required input information and entered it into ISATe for the RHVP study area.

For ISATe, the corridor needed to be further segmented resulted in creating 15 freeway segments and 8 ramp segments.

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Limitations of ISATe

The use of ISATe to conduct safety analysis has one significant limitation. The SPFs used in ISATe are not calibrated for the collision experience in Hamilton. Calibration ensures that the evaluation results are meaningful and accurate for a specific jurisdiction. The default SPFs found in ISATe is calibrated for the U.S. through NCHRP Project 17-45. Therefore, when one compares the observed number of collisions to the predicted number of collisions generated from ISATe, one is comparing local Hamilton data against the overall average number of collisions found at freeways and ramps in states in the U.S. This means that the output of ISATe is suitable only for relative rankings and not for absolute collision values. In other words, the location with the highest predicted number of collisions will most likely remain the highest compared to other RHVP locations even after recalibration (relative ranking). However, the number of calculated collisions will likely change after recalibration (absolute values).

There is insufficient data in the current study to calibrate the SPFs in ISATe for Hamilton. The ISATe User Manual states that for each site type there should be at least 100 collisions per year. For the RHVP study corridor there were only 160 total collisions for all site types spread over five years. In addition, generally many locations are needed for recalibration whereas this project covers only one highway.

4.2.3 ISATe Tool Results

ISATe was used to calculate the predicted and expected number of collisions as provided in **Table 6** for freeway segments (for both directions) and **Table 7** for ramp segments. In general, when the observed number of collisions is less than the predicted, then this is an indication that the location is performing better than average. When the observed number of collisions is greater than the predicted, this is an indication that the location is performing worse than average. The expected number of collisions is an empirical Bayes weighted average of the observed and predicted values. Therefore, the expected value is always a value in between the observed and predicted values.

Table 6 - Observed, predicted and expected number of collisions for the freeway segments

Freeway Segments										
				Observed Number of Collisions						
Name	Description	Lanes	Length (km)	Daylight	Non-Daylight	SMV	Multi-Veh.	Total Obs.	Predicted	Expected
West of Dartnall	Dartnall 1	4	0.24	1	4	1	4	5	15.4	8.9
	Dartnall 2	4	0.27	6	4	5	5	10	17.1	12.5
Between Dartnall Rd and Mud St.	Dartnall 3	4	0.16	3	0	1	2	3	9.9	6.1
	Dartnall 4	4	0.31	3	3	4	2	6	30.9	14.0
	Dartnall 5	5	0.34	5	5	5	5	10	22.3	12.8
	Mud 1	5	0.35	6	9	8	7	15	16.5	15.9
Between Mud St. and 0.4 km South of Greenhill Ave	Mud 2	5	0.24	5	1	5	1	6	8.0	7.3
	Mud 3	5	0.19	2	3	4	1	5	8.0	6.4
	Mud 4	6	0.16	6	6	6	6	12	6.6	8.9
	Mud 5	6	0.10	4	2	6	0	6	9.0	6.4
	Mud 6	5	0.34	4	7	6	5	11	51.0	16.4
	Greenhill 1	5	0.39	2	3	1	4	5	26.4	13.7
	Greenhill 2	5	0.71	4	9	5	8	13	43.2	25.3
North 0.4 km South of Greenhill Ave	Greenhill 3	5	0.16	1	0	0	1	1	8.8	4.5
	Greenhill 4	4	0.34	4	0	1	3	4	17.8	10.2

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Table 7 - Observed, predicted and expected number of collisions for the ramp segments

Ramp Segments										
Name	Description	Lanes	Length (km)	Observed Number of Collisions					Predicted	Expected
				Daylight	Non-Daylight	SMV	Multi-Veh.	Total Obs.		
Dartnall Int.	Ramp #1	1	0.23	0	0	0	0	0	3.1	1.5
	Ramp #2	1	0.24	0	0	0	0	0	1.8	1.3
	Ramp #3	1	0.48	1	0	1	0	1	40.1	7.6
	Ramp #4	1	0.66	0	0	0	0	0	5.3	3.2
Mud Int.	Ramp #5	2	0.16	4	1	2	3	5	2.0	2.6
	Ramp #6	1	0.42	11	29	37	3	40	23.3	37.1
	Ramp #7a (from Mud to end of S bend	1	0.60	2	1	3	0	3	6.4	5.1
	Ramp #7b (from S bend to RHVP)	1	0.21	5	2	6	1	7	1.9	3.7
	Ramp #8	2	0.50	0	1	1	0	1	11.4	6.0
Greenhill Int.	Ramp #9	1	0.35	3	1	3	1	4	1.4	1.8
	Ramp #10	1	0.27	1	0	1	0	1	0.9	1.0

Overall the number of observed collisions is less than the predicted number of collisions, except for the following locations:

+ Freeway segment Mud 4; and
+ Ramps 5, 6, 7b 9 and 10.

For example, for Ramp #5 there were 5 observed collisions, however the ISATe tool predicts there would be only 2 collisions.

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This difference between the expected and predicted number of collisions is referred to the as the potential for a safety improvement (PSI) and also referred to as the excess number of collisions in the Highway Safety Manual. In other words these locations stand out as performing worse than a typical location of the same facility type with similar traffic volume. These locations deserve special consideration since the number of collisions which have occurred is worse than average.

4.3 Traffic Operations

A high level review of traffic operations was undertaken for the study area. Highway Capacity Software (HCS) 2010 was utilized to examine the mainline and the ramps during the AM and PM peak periods. It was found that, generally, the study area operates well with most segments and ramps experiencing LOS "C" or better, although there are some exceptions. **Figure 9** summarizes the LOS for the various elements for the AM and PM peak periods. Detailed outputs from HCS are included in **Appendix B**.

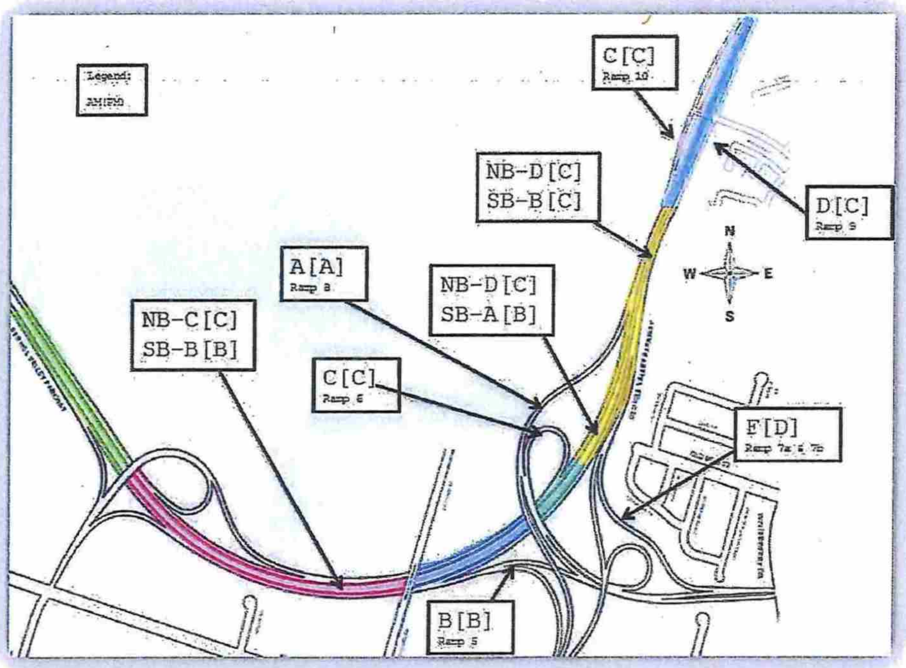

Figure 9 - Results of Operational Analysis for AM and PM Peak Periods – AM [PM]

4.4 Illumination Review

4.4.1 Methodology

The understanding that the decision to not illuminate the entire RHVP section was inextricably linked to environmental concerns and approvals, therefore review of full illumination was not undertaken but restricted to spot locations (ramps). The primary objective of illumination is to increase safety by providing drivers with improved nighttime visibility of roadway conditions and potential hazards.

However, as noted, illumination of the mainline section of the RHVP was not examined for this study. This is because the illumination design choices that were made during the design phase were intimately linked to approvals. Reference materials note that, "*The sole reason for making design changes was to reduce environmental impacts.*"[12] The Valley section of the Parkway traverses the Niagara Escarpment, a UNESCO World Biosphere Reserve, designated for its unique landform characteristics and the presence of a provincial land use plan to guide development in its area. Because of this unique area, and because of the costs associated with building a roadway on the escarpment, the City identified several design refinements that included restricting illumination to intersections and on/off ramps.[13]

Furthermore, while illumination may improve visibility at night, it may also create the situation where drivers' eyes must adjust back to darkness when leaving the illumination portion of the roadway. Therefore, the decision to provide roadway lighting should be looked at using sound criteria, but illumination decisions must also be done in the context of the surrounding roadway network. Given that environmental approvals for the roadway placed restrictions on illumination only ramps were examined for the potential installation of illumination as part of this study.

Another consideration is roadside safety. Luminaires must be installed in safe locations that recognize their potential hazard to vehicles. The location and placement of luminaires must also take into account the need for maintenance, meaning they must be accessible to workers.

Additional consideration must be given to other environmental factors as well, including "light pollution". Light pollution is can be a concern to residents living adjacent to a roadway facility. Roadway illuminating light may detract from the enjoyment of the nighttime setting and have negative effects on biological systems. Therefore, the reduction in light pollution is always a consideration in the installation of illumination in the proximity of residential lands.

In order to determine whether additional illumination should be considered for installation within the study area, the Transportation Association of Canada (TAC) Roadway Lighting Guide was used[14]. This policy is based on an analytical approach where several factors have been incorporated. The factors included in the warrants require the collection of the following types of data: geometric, operational, environmental, and collision data.

The guide differentiates the following four types of illumination: full lighting, partial interchange lighting, continuous lighting (not being examined as part of this study), and transition lighting.

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[12] Red Hill Valley Impact and Design Process, City of Hamilton, Page 3
[13] Red Hill Valley Project Public Consultation Report, March 2003, Lura Consulting, Page 136
[14] Guide for the Design of Roadway Lighting, Transportation Association of Canada (TAC), 2006

Full Lighting

Full lighting refers to lighting of the entire width within a defined area in a uniform manner, beginning at the start of the warranted area and ending where lighting is no longer warranted.

Partial Interchange Lighting

Refers to lighting at decision points where identification is required, typically at on-ramps and off-ramps. Few luminaires are needed for partial interchange lighting than for full lighting.

Transition Lighting

Refers to lighting at locations where a continuously lighted roadway tapers to fewer lanes, or locations where the continuous lighting ends and the road continues. This type of lighting assists the road users to adapt from a lighted area to an unlighted area.

Warrants

The determination of the need for illumination on freeway interchanges and freeways is performed through the use of warrants. Based on the factors included in the warrants, a rating of between 1 and 5 is assigned depending on the conditions encountered. The higher the rating, greater the hazard and the more critical is the need for illumination. To each factor a weight is also attributed, to indicate its relative importance. When factors vary within the portion of roadway for which the warrant is being undertaken, the worst case rating is recommended for the entire segment.

The forms used to determine the lighting need for freeway interchange (mainline interchange segments) and freeway (mainline segments) are provided in **Appendix C**.

Full lighting is warranted when a total point score of 60 or more is achieved, or when the night-to-day collision ratio is 2:1 or greater (which is not the case for the study area – night-to-day collision ratio is 1.10:1).

4.4.2 Illumination Results

The full illumination justification analysis was carried out for the ramps that make up the three interchanges; Dartnall Road, Mud Street and Greenhill Avenue. The two factors included in the warrants with the highest weights are the proportion of night collisions and the presence of curves, followed by the night-time operational Level of Service.

The following was found:

- Illumination of the ramps at the Dartnall Road interchange was not warranted;
- Illumination of the ramps at the Mud Street interchange was warranted; and
- Illumination of the ramps at the Greenhill Avenue interchange was not warranted.

Based on the TAC warrant, illumination of ramps at the Mud Street interchange is warranted.

However, it must be noted that the achievement of a warrant does not automatically mean that illumination must be installed. All illumination must be assessed in relation to the environmental approval constraints which exist, as well as cost of installation and maintenance implications.

Therefore, the decision to provide roadway lighting should be looked at using sound criteria, but illumination decisions must also be done in the context of the surrounding roadway network and a benefit-cost analysis.

4.5 Field Investigation and Human Factors Assessment

4.5.1 Methodology

The daytime field investigation took place on Tuesday, May 14, 2013, during morning peak and off-peak periods (07:00 a.m. – 12:00 p.m.) and during the afternoon peak (4:30 p.m. – 6:00 p.m.). At the time of the investigation the weather was cool and cloudy with no precipitation. One nighttime site investigation was also conducted during the early morning hours of Tuesday, May 14, 2013 during dark lighting conditions. At the time of the investigation the weather was cool, cloudy, with no precipitation.

High Definition video and a picture inventory from the perspective of a driver, from each lane, was collected for each of the mainline and ramp sections. Stationary observations were also undertaken from four separate locations along the mainline; from the pedestrian bridge overpass between the Dartnall Road and Mud Street interchanges, from the Pritchard Road overpass, from the east end of Mud Street (Mountain Brow Boulevard - view of the Mud Street E-W on-ramp, and from the Greenhill Avenue overpass.

Our assessment included the identification of signing installations. While direct correlation could not be determined between specific sign installations and reported collisions, it is recognized that some identified installations could have been a contributing factor. Therefore, we have suggested some signage improvements that could assist in reducing the potential that the installations become a contributing factor in a collision.

4.5.2 Field Investigation Results – Overall Systematic Findings

This section describes systemic findings that were identified within the study area overall.

Signage

The critical tasks that a road user must complete include collecting, understanding, making decisions about and reacting to information obtained from various sources, including regulatory, warning, information and guide signs. Therefore, it is critical that the information on signs can be well understood within the context of the surrounding roadway, which is a function of the travel speed, the legibility of the sign, background distractions and driver workload

Generally, it was found that the freeway signage follows OTM guidance for placement and message. However, in some instances it appears that there is more signing in place than what is required. It was also found that the positioning of some signs could be improved. In a few locations, including some where critical decisions are required to be made by drivers, signs are so closely spaced that they obscure each other and/or cannot be properly seen, read and/or comprehended.

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TRAILBLAZER INFORMATION SIGN DISPLAYS

The primary purpose of a guide or information sign is to direct road users along a roadway. The trailblazer information sign displays for the RHVP and the Linc contain detailed information which can be challenging for an approaching road user to fully read. The displays contain varying, text sizes and information and functionally only serves as a logo, not a sign with a specific text message. Significant variation in the use of these signs, in conjunction with directional information leading to other highways (403 and QEW) were noted and can be seen in **Figure 10.**

Figure 10 - Trailblazer Information Sign Displays (Various Locations Leading to RHVP/Link On-Ramps)

LANE EXIT SIGNS

This sign is normally reserved for freeway mainlines to provide advance warning where an entire lane does not continue and exits from the one side of the road and leads to a different destination from that of the remaining lanes of the through roadway. This sign is inappropriately used in a few instances on ramps where the driver has already left the mainline. **Figure 11** provides an example of one such case.

Figure 11 - Lane Exit Warning Sign on Ramp (Off-Ramp to Stone Church Road)

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4.5.3 Field Investigation Results – Location Specific Issues

This section describes issues identified throughout the study area by location.

RHVP Southbound Mainline

CLOSELY-SPACED SIGNAGE AND "SLOWER TRAFFIC KEEP RIGHT" SIGN AT DIVERGE POINT (MUD 5)

A group of closely-spaced signs exists immediately upstream of the Stone Church Road and Mud Street off-ramp. Given the amount of information in a short stretch of road and the fact that this is a critical decision point on the mainline, the message of each sign could be lost and could contribute to driver confusion. **Figure 12** shows the current situation. There is also a "SLOWER TRAFFIC KEEP RIGHT" sign installed at the beginning of the Stone Church Road / Mud Street diverge point where the right lane becomes a dedicated exit lane. This message may be confusing to road users, and could possibly lead to weaving conflicts. **Figure 13** shows the current situation.

Figure 12 - Closely-Spaced Signage Upstream of the Stone Church Road and Mud Street Off-Ramp (View South from the Mainline)

Figure 13 - "SLOWER TRAFFIC KEEP RIGHT" Sign Upstream of the Stone Church Road and Mud Street Off-Ramp (View South from the Mainline)

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OBSCURED FREEWAY EXIT SIGN (MUD 5)

The Freeway Exit sign in the gore area of the Stone Church Road / Mud Street off-ramp is partially eclipsed by the Object Marker warning sign on approach. **Figure 14** shows the current situation.

Figure 14 - Freeway Exit sign Partially Eclipsed by the Object Marker Warning Sign (View South from the Mainline)

CHANGE IN ALIGNMENT THROUGH MAINLINE CURVE (DARTNALL 5)

On the southbound mainline alignment changes through the horizontal curve just south of the Pritchard Road overpass, part-way through the horizontal curve, there is a tangent section, and then the curve continues. The change is very noticeable when viewed from the Pritchard Road overpass. **Figure 15** shows this issue.

Figure 15 - View of Change in Horizontal Curve on the Mainline (View West from Pritchard Road Overpass)

Many drivers were observed traversing or closely approaching the inside (median) edge line of the highway. Some vehicles were observed driving over the rumble strips and then overcorrecting to position themselves back into their travel lane. Overcorrection actions were observed less often during the peak hours, possibly due to lower speeds. **Figure 16** provides examples of this case.

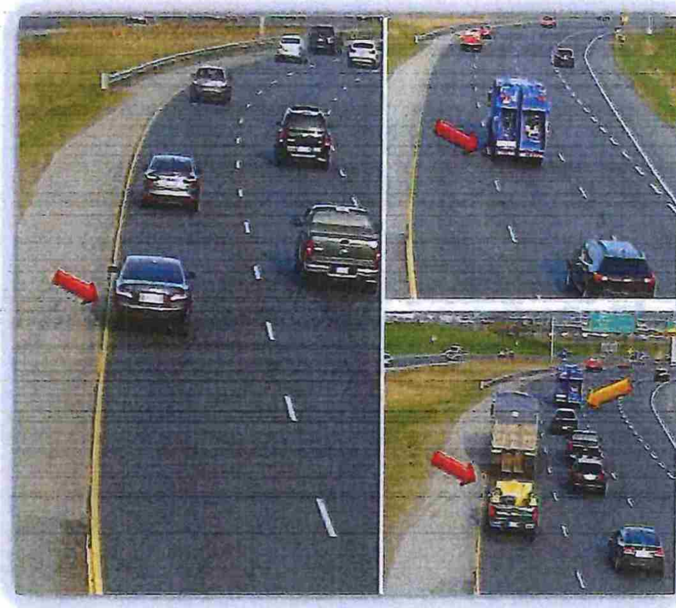

Figure 16 - Observed Cases of Swerve- and Overcorrection-Manoeuvers (View West from Pritchard Road Overpass)

In the figure, the photos illustrate drivers approaching the edge lines (emphasized with the red-coloured arrow). The picture on the right illustrates the overcorrection manoeuver made by the driver in the garbage truck in the center lane of the mainline. Subsequent to the initial correction manoeuver and as a result of overcorrection, the driver had veered closer to the outside of the lane (emphasized with the orange-coloured arrow). It is important to note that no collisions were able to be directly attributed to this issue. The condition is not present in the northbound lanes.

RHVP Northbound Mainline

OBSCURED INFORMATION SIGN (DARTNALL 4)

The information sign for Stone Church Road / Mud Street located approximately 500 metres upstream of the Stone Church Road / Mud Street off-ramp is marginally eclipsed by the Deer Crossing warning sign immediately in advance. **Figure 17** shows the current situation.

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Figure 17 - Deer Crossing Warning Sign Obscuring Information Sign (View North from the Mainline)

POTENTIALLY RESTRICTED SIGHTLINES FOR MERGING TRAFFIC (DARTNALL 4)

The on-ramp merge lane is located within a horizontal curve in the mainline. Vehicles northbound on the mainline and upstream of the ramp may not be easily visible from the vantage point of a merging driver given the curvature of the road and the angle of approach which creates a large blind spot. Perhaps because of this large blind spot, many drivers were observed merging onto the mainline immediately downstream of the gore area despite the long acceleration lane available, and even when adequate gaps were not available. These actions could lead to sideswipe collisions, rear-end collisions or SMV collisions if evasive manoeuvres are undertaken by either or both drivers. **Figure 18** provides an example.

Figure 18 - Potentially Restricted Sightlines for Merging Traffic

UNEVEN TERRAIN IN FRONT OF GUIDE RAIL (MUD 1)

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The terrain is uneven immediately in front of the steel beam guide rail system in the median downstream of the Stone Church Road / Mud Street diverge point. The purpose of the guide rail system is to shield arrant vehicles from the columns of the Stone Church Road / Mud Street overpass structure. If an errant vehicle were to run off the road in this location, they would ride up on the uneven grassy terrain in front of the barrier causing the vehicle to strike the system at a higher point than it is designed for. This could lead to the overturning of a vehicle, and possibly continuation into the column being shielded. **Figure 19** shows the current situation.

Figure 19 - Uneven Terrain Immediately In Front of the Steel Beam Guide Rail System (View North from the Mainline)

CLOSELY SPACED SIGNAGE (MUD 5)

A "PLEASE AVOID USE OF ENGINE BRAKES" advisory sign located downstream of the Mud Street on-ramp between a Lane Drop and Bridge Ices warning sign. These signs are closely spaced and within the vicinity of a complex merging area where drivers from Mud Street are required to perform two consecutive merging maneuvers; one from the Stone Church on-ramp and then another onto the mainline of the RHVP. Given the nature of the location, the warning signs are the highest priority and require the immediate attention of drivers. In its current configuration, the signage in this area could potentially lead to driver information overload and possible conflicts. **Figure 20** shows the current situation.

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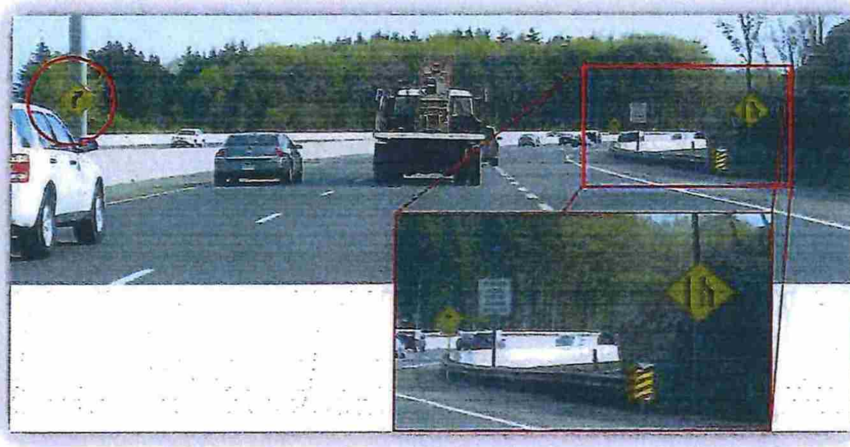

Figure 20 - Closely Spaced Signs within the Vicinity of a Complex Merging Area (View North from the Mainline)

Dartnall Road S-E On-Ramp (Ramp 2)

CULVERT WITHIN DEFLECTION AREA OF APPROACH ECCENTRIC LOADER END TREATMENT

The culvert and drop-off adjacent to the guide rail system at the beginning of the Dartnall Road on-ramp is within the run-out area of the Eccentric Loader approach end treatment. If the end treatment is stuck, it is possible that the vehicle will also come into contact with the culvert and/or descend into the ditch. **Figure 21** shows the current situation.

Figure 21 – Culvert and Ditch within Deflection Area of Approach Eccentric Loader End Treatment (View North from Beginning of Off-Ramp)

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Mud Street W-E Off-Ramp (Ramp 5)

The outside (right) lane ends within the horizontal curve downstream of the mainline. The taper ending the lane occurs within the curve, forcing traffic to merge within the curve which requires a driver to perform two workload intensive maneuvers at the same time. Contributing to this, the overhead sign located at the diverge point (and just prior to the lane ends sign for the right lane) indicates that there are two lanes destined for Mud Street. This could contribute to the potential for a collision. **Figure 22** shows the current situation.

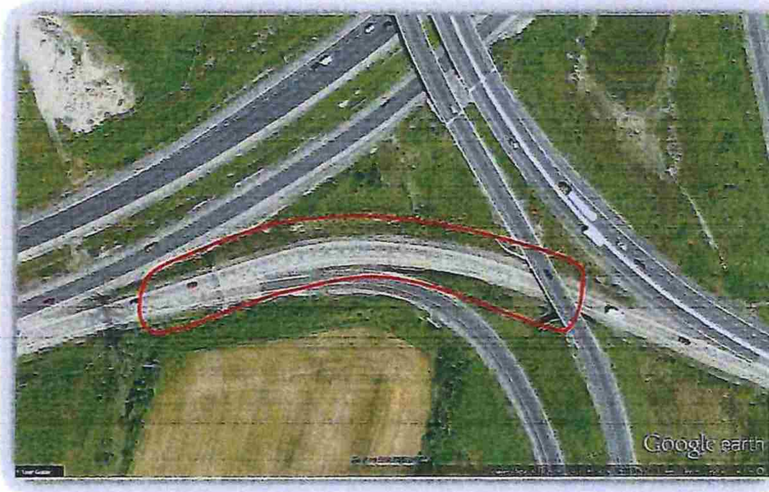

Figure 22 - Outside Lane Ends within Horizontal Curve

Mud Street E-W On-Ramp (Ramp 6)

CLOSELY-SPACED AND ECLIPSING SIGNAGE

A group of closely-spaced signage exists in the ramp gore area (near Winterberry Drive). Many of the signs eclipse each other on approach, most notably the information sign for the Linc and the Lane Drop warning sign are not clearly visible to drivers but provide valuable information that needs to be legible. **Figure 23** shows this signage configuration from two vantage points.

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Figure 23 - Closely-Spaced and Eclipsing Signage (View West from Beginning of On-Ramps)

EVIDENCE OF LANE DEPARTURES

Evidence of vehicles departing the travel lane was identified on the outside of the ramp. **Figure 24** provides examples.

Figure 24 - Evidence of Lane Departures

Mud Street E-N On-Ramp (Ramp 7a)

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CLOSELY-SPACED AND "BACK-DROPPED" SIGNAGE

As noted for the Mud Street E-W on-ramp, a group of closely-spaced signage exists in the ramp gore area. The 40 km/h advisory signage for this ramp is placed amongst signage for the Mud Street E-W on-ramp and is easily lost in the jumble. Although sign-eclipsing isn't an issue here, the signs are back-dropped by the information sign for the Linc. Also, the Lane Ends warning sign for the Mud

Street E-W on-ramp is located between the Freeway Exit sign and the Mud Street E-W on-ramp information sign, which could cause further confusion. The previous **Figure 24** shows the current situation.

INAPPROPRIATE WARNING SIGN FOR CONFIGURATION

The Merge warning sign on approach to the Stone Church Road East S-N on-ramp is inappropriate for the configuration. The driver on the E-N ramp is the one who is merging onto the S-N ramp. This sign indicates that another lane is joining from the right and could cause driver confusion. A Lane Ends warning sign is required, as opposed to the Merge warning sign. **Figure 25** shows the current situation.

Figure 25 – Inappropriate Merge Warning Sign (View North from On-Ramp)

Stone Church Road East N-S Off-Ramp & Mud Street N-E Off-Ramp (Ramp 8)

LOCATION OF INFORMATION SIGNS

The information and lane designation signs at the diverge point from RHVP indicates both ramp lanes to lead to Mud Street and Stone Church Road. Small information signs indicating that the left lane leads to Mud Street and the right lane leads to Stone Church Road are located approximately 160 metres upstream of the forced diverge point for Mud Street and Stone Church Road, are directly behind curve warning signs and immediately before a curve. Since the information signs are small there is a good chance that a driver will not detect them. Also, due to the horizontal curvature of the ramp, the signs are not visible very far in advance (they fall outside the driver's cone of vision through the curve), and as a result, sudden lane changes and potentially related conflicts, may occur in this area.

If the small information signs are missed the next available signage to inform road users of the appropriate lane decision are located at the diverge point. However, similar to the previous information signs, given the horizontal curvature of the ramp, the signs are not visible in advance of their placement and sudden lane changes, and potentially related conflicts, may occur in this area. **Figure 26** shows the current situation of the drivers' approach to the diverge area.

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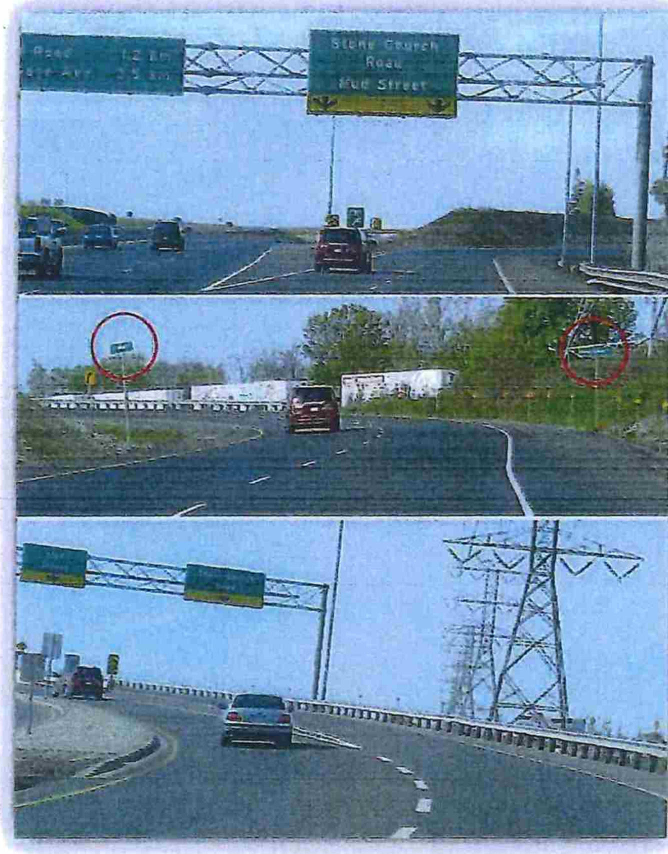

Figure 26 - Information Signs Leading to Mud Street and Stone Church Road (View South Successively Traveling South)

INCONSISTENT CURVE WARNING SIGNS ON THE RAMP

The curve warning signs on either side of the road on the off-ramp provide inconsistent information regarding the severity of the curve. It is important that consistent and appropriate warning the severity of a curve be provided to a driver in order to assist them in making the appropriate decisions to safety navigate through the curve. **Figure 27** shows the current situation.

Figure 27 - Conflicting Curve Warning Signs on the Ramp

5. Summary of Findings

This section summarizes the findings from the collision, ISATe and field reviews. Where possible, road sections have been grouped by similar characteristics and findings, similar to the more aggregated sections shown in **Figure 3** earlier in the report.

Overall, it was found that the RHVP is operating safely with the calculated expected number of collisions being lower than the predicted number of collisions for a roadway with similar characteristics in most segments. During the study period, no collisions were reported on Ramps 2, 3 and 4, and just two collisions were reported on Ramp 8 and one collision on Ramp 10. However, it is important to note that half of the ramps collisions were reported on Ramp 6 (from Mud Street westbound to the Linc westbound).

For mainline, the segment that experienced the highest proportion of collisions (43%) was between Mud Street and 0.4 km South of Greenhill Avenue, which also represents the longest segment with a total length of 1.5 kilometres. The next highest segment was between Dartnall Road and Mud Street which experienced 28% of the mainline collisions.

The output of the ISATe tool indicated that freeway segment Mud 4 and ramps 5, 6, 7b 9 and 10 have an excess number of collisions as indicated by a positive difference between the expected and predicted number of collisions. This is indicative of a potential for a safety improvement (PSI). In other words, these locations stand out as performing worse than a typical location of the same facility type with similar traffic volume.

It is also noteworthy that the collisions that are occurring on the RHVP show an atypically high proportion of SMV, wet road surface and non-daylight collisions when compared to the Provincial and City of Hamilton averages.

The TAC illumination warrants were examined as part of this study and it was determined that the Mud Street interchange would meet the justification for interchange illumination, although only by a small margin. However, just because a warrant has been achieved does not mean that illumination must or can be implemented. Environmental constraints and approvals must be considered before pursing the recommendation to illuminate.

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Table 8 summarizes the road segment findings and **Table 9** summarizes the ramp findings.

Table 8 - Summary of Road Segment Findings

Name	Road Segment	Collisions				Field
		Obs.	Pred.	Exp.	Pattern	
West of Dartnall	Dartnall 1 & 2	15	32.5	21.4	✦ None	✦ No major findings
Between Dartnall & Mud	Dartnall 3, 4 & 5	19	63.1	32.8	✦ 48% SMV	✦ Potentially restricted sightlines for merging traffic from Dartnall onto NB RHVP ✦ Placement of exit information sign potentially confusing NB RHVP ✦ Exit information sign partially obscured NB RHVP ✦ Change in alignment in SB direction
Between Mud & Greenhill	Mud 1, 2 & 3	26	32.5	29.6	✦ 60% SMV ✦ 50% non-daylight	✦ Unshielded hazard SB ✦ Uneven terrain in front of guiderail NB
	Mud 4, 5 & 6	29	66.6	31.6	✦ **Exp. >. Pred. @ Mud 4** ✦ Primarily SMV ✦ High proportion of non-daylight & wet surface	✦ Closely spaced & obscured signage at critical decision points NB & SB ✦ Potentially confusing "keep right" sign SB
	Greenhill 1 to 4	23	96.2	53.8	✦ None	✦ No major findings

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Table 9 - Summary of Ramp Findings

Name	Ramp	Collisions				Field
		Obs.	Pred.	Exp.	Pattern	
Greenhill Int.	Ramp 1 & 2	n/a	n/a	n/a	+ n/a	+ Culvert within deflection area of approach eccentric loader end treatment (Ramp 2)
	Ramp 3	1	40.1	7.6	+ n/a	+ No major findings
	Ramp 4	n/a	n/a	n/a	+ n/a	+ No major findings
Mud Int.	Ramp 5	5	2.0	2.6	+ n/a	+ Lane ends within curve
	Ramp 6	40	23.3	37.1	+ **Exp. > Pred.** + 65% of all ramp collisions + High proportion & frequency of SMV, non-daylight & wet surface	+ Closely spaced / eclipsing signage at diverge point + Evidence of lane departures
	Ramp 7a 7 7b	10	8.3	8.8	+ **Exp. > Pred.** + 80% of collisions SMV + High proportion of non-daylight & wet surface	+ Closely spaced & back dropped signage at diverge + Inappropriate merge sign +
	Ramp 8	1	0.9	1	+ **Exp. > Pred.,** however very low # of collisions	+ Location and size of information signs + Inconsistent curve warning signs

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Greenhill Int.	Ramp 9	4	1.4	1.8	Exp. > Pred., however very low # of collisions	No major findings
	Ramp 10	1	0.9	1.0	Exp. > Pred., however very low # of collisions	No major findings

6. Potential Countermeasures and Benefit-Cost Analysis

A list of potential countermeasures was developed to address the issues that were found in the previous sections. In keeping within the limitations of this study, the countermeasures that were developed do not propose to alter the geometry of the mainline or ramps on the RHVP.

In order to assist in determining the effectiveness of a countermeasure, collision modification factors (CMFs) were utilized where available. CMFs were examined from a number of sources including the HSM, the FHWA CMF Clearinghouse[15] and the MTO SafetyAnalyst project. The CMF of a countermeasure can assist in determining safety benefits of the countermeasure over the analysis period by calculating the expected number of collisions reduced. There are a number of countermeasures for which CMFs were not available. The CMF values are applicable to all collision types that occur at a site, unless the CMF is specific to the related collision impact type(s) (e.g., single-vehicle collision with fixed object).

The Benefit-Cost (B/C) ratio is the ratio of the present value of the safety benefit of a given countermeasure calculated for its service life to the present value of the cost of the countermeasure. A B/C ratio of greater than 1.0 represents an economically efficient countermeasure. In this criterion, the monetary value of the collisions reduced as a result of implementation of a countermeasure is considered as the benefit of the countermeasure. A comparison among the B/C ratios of the alternative countermeasures proposed for a site leads to the most economically efficient countermeasure. The alternative countermeasure with a higher B/C is considered as the preferred alternative. For the purposes of calculating the societal costs of collisions, MTO costs were utilized and projected to 2013 dollars. The resultant costs are summarized in **Table 10**. Details of the B/C analysis are included in **Appendix D**.

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[15] http://www.cmfclearinghouse.org/

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Table 10 - Annual Societal Costs of Collisions (inflated from 2004)

Severity of Collision	2013 Societal Cost	Proportion of Collisions
Fatal	$1,308,127	0.5%
Injury	$31,599	34%
PDO	$9,654	65.5%

The costs for the various countermeasures are meant to be high-level estimates and represent typical industry standard costs, where available, meaning that actual costs may vary from those noted in this report. The purpose of these costs is to provide the City a good basis upon which plans for implementing the various countermeasures could be made.

6.1 General Pavement Friction

6.1.1 Perform Friction Testing

Pavement friction plays a vital role in keeping vehicles on the road by enabling the drivers to control/maneuver the vehicle in a safe manner (in both the longitudinal and lateral directions). Several methods and devices are available for measuring pavement frictional characteristics. Pavement surface texture is influenced by many factors, including aggregate type and size, mixture proportions, and texture orientation and details. Texture is defined by two levels: microtexture and macrotexture. Currently, there are no direct means for measuring microtexture in the field. However because microtexture is related to low slip speed friction, it can be estimated using a surrogate device. Macrotexture is characterized by the mean texture depth and the mean profile depth; several types of equipment are available for measuring these indices. Because of the high proportion of wet surface condition and SMV collisions, the City could consider undertaking pavement friction testing on the asphalt to get a baseline friction coefficient for which to compare to design specifications.

Cost-Benefit Ratio

The costs to undertake these tests are not expected to exceed $20,000. Based on the results, the City may be in a better position to determine if further action is required.

6.2 Overall Study Area Countermeasures

The following potential countermeasures should be installed as an overall measure due to the need to create consistency throughout the RHVP.

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6.2.1 Permanent Raised Pavement Markings (PRPM)

PRPMs are delineation devices that are often used to improve preview distances and guidance for drivers in inclement weather and low-light conditions. Given the wet roadway condition and non-daylight trend in collisions along the RHVP, combined with the curvilinear geometry of the roadway, PRPMs have the potential to positively affect the collision experience on the roadway as well as increase driver security.

Benefit-Cost Ratio

The CMF used for this assessment was 0.94 and is related to all collision types. The calculated benefit would be a reduction of 10.2 collisions over a five-year period. The expected service life for this countermeasure is 5 years, for a total benefit of $245,593. The costs associated with this countermeasure are expected to be $74,700. The B/C ratio is expected to be 3.29.

6.2.2 High Visibility Inverted Profile Pavement Markings

Conventional traffic striping materials are coated with a surface layer of glass beads. These beads reflect light from the vehicle's headlights back to the driver's eyes providing enhanced visibility of the lines in the dark. However, when conventional flat lanes are wet, the glass beads may become coated with water which may reduce the lines' ability to reflect light back to the driver. The high visibility inverted profile pavement markers have inverted profiles into the marking. The tiny profiles form small ridges which assist in draining water away from the marking. This helps to reduce the chances of the glass beads becoming covered with water allowing then to continue to reflect light, increasing the visibility of the markings during rain events.

This countermeasure would be an alternative to PRPMs. It is also important to understand that this countermeasure must be installed in a ground-out portion of asphalt in order to be snow plough-able.

Benefit-Cost Ratio

There is no specific CMF for this countermeasure, however, in generally, increasing the retro reflectivity of lanes lines increases their visibility which can improve the drivers' ability to stay within the lane as well as increase the drivers' preview distance of the road ahead. This can assist in reducing crashing and increasing driver security.

6.2.3 Wide Pavement Markings (102 mm to 150 mm)

Wide pavement markings can be used to improve preview distances and guidance for drivers in inclement weather and low-light conditions. Given the wet roadway condition and non-daylight trend in collisions along the RHVP, combined with the curvilinear geometry of the roadway, wide pavement markings have the potential to positively affect the collision experience on the roadway as well as increase driver security.

Benefit-Cost Ratio

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The CMF used for this assessment was 0.96 and is related to fatal and injury collision types. The calculated benefit would be a reduction of 2.6 collisions over a five-year period. The expected service life for this countermeasure is 5 years, for a total benefit of $135,537. The costs associated with this countermeasure are expected to be $40,000. The B/C ratio is expected to be 3.39.

6.2.4 Install Wc-105 Slippery When Wet Signs

The purpose for the Slippery When Wet sign is to advise drivers that the surface of the roadway has a significantly reduced wet weather skid resistance. Competent drivers are aware that the friction of the road surface is reduced in wet weather; therefore this sign is reserved for use where the skid resistance of the road is reduced to an expectantly low level. Given the high proportion of wet surface collisions, it may be determined through friction testing that the skid resistance of the roadway surface is lower than normally encountered in some areas. If this is determined, the City could examine the installation of the Wc-105 sign for the northbound and southbound directions in relation to any areas identified through friction testing.

Cost-Benefit Ratio

There is no specific CMF for the installation of these signs. However the costs to install signs are not likely to exceed $5,000.

6.2.5 Enforcement of Travel Speeds

The exact relation between speed and crashes depends on many factors. However, in a general sense the relation is very clear: if on a road the driven speeds become higher, the crash rate will also increase. Therefore, targeted enforcement of known high crash areas can be an effective means to reduce the crash rate.

Benefit-Cost Ratio

There is no CMF or cost for this countermeasure. Speed enforcement is a regular activity undertaken by the Police, therefore targeting specific areas should not increase costs. The City could consider approaching the Police to determine if there are areas where speed enforcement activities could be undertaken.

6.2.6 Rationalization of Trailblazer Signs

The trailblazer information sign displays for the RHVP and the Linc contain a lot of information for an approaching road user to read, process, and make an appropriate decision. The displays contain varying text sizes and information. Each display contains a number of individual pieces of information, and in some, a number of different physical signs. The City could examine increasing the font size of the pertinent information on the trailblazer signs and possibly adding the QEW and 403 signs to each of the markers to assist unfamiliar drivers to determine if they should be taking the RHVP or the Linc to reach their intended destination.

Benefit-Cost Ratio

These trailblazer signs cannot be directly linked to any specific collisions, nor is there a corresponding CMF. However, the costs to replace or add signs would not be expected to exceed $2,000, and because they are not on the mainline, special traffic protection would not be required to install the signs.

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6.2.7 Remove Lane Exits Signs from Ramps

The Lane Exits sign exists in several locations on ramps where its use is not intended. The City could examine the potential to remove these signs.

Cost-Benefit Ratio

These Lane Exists signs cannot be directly linked to any specific collisions, nor is there a corresponding CMF. However, the costs to remove the sign would not be expected to exceed $1,000, and because they are not on the mainline, special traffic protection would not be required to install the signs.

6.3 Site Specific Countermeasures

6.3.1 Dartnall Segments 1 & 2

There was no major collision or field findings in this segment.

6.3.2 Dartnall Segments 3, 4 & 5

The main collision finding through these segments was the high proportion SMV type collisions, at 48%, as well as a significant number of wet road condition collisions. In the field, sightline challenges as well as the placement of several signs were the primary findings, as well as the alignment discontinuity in the southbound mainline. The following improvements could be considered for implementation.

Extend Solid White Line from Gore Area on Dartnall S-E Ramp

Due to the angle of approach between the northbound mainline drivers and the drivers merging from the Dartnall Road S-E ramp, it can be challenging for the merging drivers to properly detect a safe gap in traffic. It was observed in the field that drivers tended to enter the through lane abruptly at the beginning of the broken line. If the solid line were extended further from the gore area, it would encourage drivers to utilize more of the speed change lane, which would have the effect of bringing their speed up more in line with the through vehicles (reducing the speed variance), as well as improving their chances of detecting a safe gap in traffic in which to merge.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however the costs are not expected to exceed $500 so we recommend implementing this countermeasure.

Remove Deer Warning Sign

The Stone Church Road / Mud Street exit information sign located within the taper for the Dartnall S-E on-ramp is partially obscured by a Deer Warning sign. The City could consider removing (there were no animal related collisions in five years) the Deer Warning sign.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however the costs are not expected to exceed $500 so we recommend implementing this countermeasure.

Correct Change in Alignment in Southbound Direction

In the southbound direction there is a change in alignment that occurs wherein there is a tangent section of roadway between two curves, but within an intended smooth curve. We are unsure why the roadway was built this way as the design drawings do not show this occurring. It is difficult to attribute any collisions to this geometric aspect, however, it is clear that it catches drivers off-guard and leads to wandering in the lanes. The City could consider smoothing out the alignment through the use of pavement markings by shifting the flat area by approximately 1.6 metres, as shown in **Figure 28.** This would allow the outside yellow line to fall within the existing roadway platform, although it would be on the current paved shoulder and would require filling and regrinding of the existing edge line rumble strips. **Final recommendations for this countermeasure would require additional examination of the road design that was not possible with the data provided for this study.**

Figure 28 - Potential Pavement Marking Adjustment

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $4,000.

6.3.3 Mud Segments 1, 2 & 3

The main collision finding through these segments was the high proportion SMV type collisions as well as non-daylight collisions. The field investigation revealed minor deficiencies relating primarily to a guiderail installation in the northbound direction.

Flatten Slope or Raise Guiderail in Northbound Direction

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In the northbound direction within the median downstream of the Stone Church Road / Mud Street diverge point there is a guiderail system with a mound of terrain immediately adjacent to the front of the system. If an errant vehicle were to run off the road in this location, they would ride up on the uneven grassy terrain in front of the barrier causing the vehicle to strike the system at a higher point than it is designed for. This could lead to the overturning of a vehicle, and possibly continuation into the column being shielded. The City could examine the possibility to either lower the terrain or raise the guiderail system.

COST-BENEFIT RATIO

There have not been any collisions associated with this guiderail, nor are there any CMFs directly related to regarding the terrain adjacent to a guiderail. However, this could be considered maintenance of the system and the costs are expected to be low.

6.3.4 Mud Segments 4, 5 & 6

Similar to other segments, the main collision finding through these segments was the high proportion SMV type as well as wet surface and non-daylight collisions. Of additional note, the segment Mud 4 shows a positive PSI. The field review found issues with closely spaced and potentially confusing signage installations.

Relocate "ENGINE BRAKES" Sign (Northbound)

A "PLEASE AVOID USE OF ENGINE BRAKES" advisory sign located downstream of the Mud Street on-ramp between a Lane Drop and Bridge Ices warning sign. These signs are closely spaced and within the vicinity of a complex merging area where drivers from Mud Street are required to perform two consecutive merging maneuvers. Given the nature of the location, the warning signs are the highest priority and require the immediate attention of drivers. In its current configuration, the signage in this area could potentially lead to driver-overload and possible conflicts. The City could consider relocating the "ENGINE BRAKES" sign further north beyond the end of the taper.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $500 so we recommend implementing this countermeasure.

Remove "Slower Traffic Keep Right" Sign at Stone Church / Mud Diverge (Southbound)

There are a number of Slower Traffic Keep Right signs in the northbound direction through the study area. While this is generally good advice, there is one sign posted immediately before the Stone Church Road / Mud Street diverge point where the right lane becomes a dedicated exit lane for the freeway exit. Providing this message at this point may be confusing to road users, and could possibly lead to weaving conflicts. This sign is also part of a group of closely spaced signs in the area. The City could consider removing the sign located immediately upstream of the Stone Church Road / Mud Street diverge.

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COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $500 so we recommend implementing this countermeasure.

Relocate Object Marker Sign (Southbound)

The Freeway Exit sign in the gore area of the Stone Church Road / Mud Street off-ramp is partially eclipsed by the Object Marker warning sign on approach. The City could consider relocating the object marker sign to the post of the exit sign.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $500 so we recommend implementing this countermeasure.

6.3.5 Greenhill Segments 1 to 4

There was no major collision or field findings in this segment.

6.3.6 Ramps 1 & 2

There were no major collision findings for these ramps, however, during the field review it was noted that there are a couple of minor issues with roadside elements.

Redesign End Treatment on Guiderail (Ramp 2)

The culvert and drop-off adjacent to the guide rail system at the beginning of the Dartnall Road on-ramp is within the run-out area of the Eccentric Loader approach end treatment. If the end treatment is struck, it is possible that the vehicle will also come into contact with the culvert and/or the ditch. An extruder end treatment demands less adjacent deflection area upon impact than the Eccentric Loader, preventing an impacted vehicle from traveling through the breakaway area of the system. The City could consider replacing the eccentric loader with an extruder end treatment.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $11,000.

6.3.7 Ramps 3 & 4

There was no major collision or field findings for these ramps.

6.3.8 Ramp 5

There were no major collision findings for this ramp; however the following items were noted.

Illumination

The outcome of the TAC illumination warrant indicated that illumination of the ramp is justified, however it is not being recommended at this time as the cost to install and maintain the illumination is much greater than the calculated benefit.

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COST-BENEFIT RATIO

The CMF used for this assessment was 0.6 and is related to all types of nighttime collisions. The expected service life for this countermeasure is 20 years. A total benefit of $19,954 and costs of $275,000 for a B/C ratio of 0.07 was calculated.

Revise Pavement Markings for Ramps

It was found during the field investigation that the two lane off-ramp diverges into one lane for Stone Church Road and two lanes that merge to one lane for Mud Street. This merge on the Mud Street section of the ramp occurs within a curve immediately downstream of the diverge point of the ramps. The City could consider restriping the entire ramp to have one lane exit to Stone Church Road and one lane exit to Mud Street thereby eliminating the need for the merge on the curve on approach to Mud Street. The overhead sign for Mud Street would also need to be revised to indicate only one lane is destined to Mud Street.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $8,000.

6.3.9 Ramp 6

This ramp was found to be the poorest performing segment of the RHVP that was reviewed for this assignment and was noted as having a positive PSI. This ramp has experienced 65% of all collisions occurring on ramps, and like other areas, has a high proportion of SMV, wet surface and non-daylight collisions. The field review noted evidence of run off the road collisions, as well as some closely spaced and eclipsing signage at the diverge point from Ramp 7a.

The City has installed improved signage on the ramp in the recent past. Because this signage was installed after the period for which collisions were available for this review, any effect that this improved signage may have on collisions on the ramp cannot be quantified in this review.

Illumination

The outcome of the TAC illumination warrant indicated that illumination of the ramp is justified. Illumination increases a drivers' preview area and increases safety by providing drivers with improved nighttime visibility of roadway conditions and potential hazards. However, intermittent installation of illumination should be avoided as it creates dark spots that require drivers' eyes to readjust to the low-light levels, temporarily reducing their visibility even further, therefore installation of illumination on Ramp 5 should be considered in context with the surrounding roadway network.

COST-BENEFIT RATIO

The CMF used for this assessment was 0.6 and is related to all types of nighttime collisions. The expected service life for this countermeasure is 20 years. A total benefit of $1,040,193 and costs of $275,000 for a B/C ratio of 3.78 was calculated.

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Install High Friction Pavement on Approach to and through Curve

In locations where drivers may brake excessively; for example, when going around curves; the road surface can become prematurely polished, reducing the pavement friction and allowing vehicles to skid when drivers brake. Drivers may also be speeding or distracted, contributing to the high-collision rates in this location. Wet road surfaces can also reduce pavement friction and cause skidding or hydroplaning. High friction surface (HFS) treatment can dramatically and immediately reduces crashes. With friction demands far exceeding conventional pavement friction, high-quality aggregate is applied to existing or potential high-crash areas to help motorists maintain better control in dry and wet driving conditions. While the initial costs are higher than conventional pavement, limited use in critical locations where high numbers of collisions occur makes the product a low-cost option over its life cycle. The City could consider installed a HFS treatment on approach to and through the curve at the end of the ramp.

COST-BENEFIT RATIO

The CMF used for this assessment was 0.76 and is related to all collision types. The calculated benefit would be a reduction of 8.9 collisions over a five-year period. The expected service life for this countermeasure is 5 years, for a total benefit of $215,212. The costs associated with this countermeasure are expected to be $92,900. The B/C ratio is expected to be 2.32.

Install Progressively Larger Chevron Signs

Inappropriate speeds are expected to be the major cause of the run-off-the-road type collisions occurring at this ramp. Since driving is a task with a substantial contribution from vision, the use of lighting and visual information such as signage can assist in providing appropriate cues to encourage appropriate driving speeds. Modifying the use of chevrons to employ progressively-increasing sizes throughout a curve, and adjusting the spacing of them to provide an appearance consistent with a smaller radius curve (about two-thirds the radius of the original curve) can increase perceptions of sharpness by drivers, and can result in greater speed reductions. The City could consider installing modified chevron signs along the curve.

Active chevrons, such as the ones that are currently in place on the MTO connection at the north end of the RHVP, were considered, however they are not being recommended due to the combination of their cost and their vulnerability to being hit in the context of Ramp 6. On the MTO ramp they are mounted on top of a concrete tall wall and are not exposed to being hit by vehicles. On Ramp 6, given the history of run-off-the-road collisions, the expectation that they would be struck by errant vehicles is high.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $4,000.

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Install Pavement Marking Text

A pavement marking placed on the roadway indicating that the driver should reduce speed for an upcoming curve is being promoted in the U.S. on sections of roads or corridors with higher than average numbers of crashes having roadway curvature as a contributing factor. The pavement marking consists of a "SLOW" legend and an arrow indicating the direction of the upcoming curve. The overall objective is to reduce the upper percentile speed, thus reducing the number of vehicles leaving the roadway and being involved in a collision. The City could consider installing these pavement markings to reinforce to drivers that they must reduce their speed for the curve.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $1,500.

Install Dynamic / Variable Warning Sign

Dynamic or variable warning signs are widely used to convey all manners of information to drivers. In order to reinforce the need for drivers to slow their vehicles for the curve, these warning signs could be used to:

- Display the vehicle's speed versus the posted warning speed;
- Display a message "SLOW DOWN" "TOO FAST" (or other) to vehicles travelling over a set speed threshold; or
- Display a Ramp Speed Advisory sign (transition from dark to lit) when a vehicle is detected as exceeding the recommended ramp speed.

These signs have proven to be effective in reducing the speed of vehicles. The City could consider installing a dynamic / variable warning sign on approach to the curve in the ramp.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however costs are not expected to exceed $7,000 including solar power option, wiring, installation, etc.

Install Flashing Amber Beacons on Signs

Using flashing beacons with a warning sign is another way to gain motorists' attention. The beacons are typically used with one of the advance Horizontal Alignment signs for a horizontal curve. One factor limiting their use is the availability of an accessible power source, although solar power panel systems can be used as well. The beacons can be flashed either alternately or simultaneously. The safety effectiveness of this particular treatment is yet to be established, but a 1970s study evaluated the effects of signing to warn drivers of wet weather skidding hazards at horizontal curves. The study concluded that agencies could significantly reduce vehicle speed by adding flashing beacons on curve warning signs. The City could consider adding flashing beacons to the warning signs and/or the chevron signs, similar to what the MTO has implemented on a ramp at the north end of the RHVP.

COST-BENEFIT RATIO

There is no CMF for this countermeasure on its own; however, in combination with advance curve warning signs and chevron signs, CMFs for the devices installed collectively show a positive reduction in collisions at a curve. Costs per beacon are not expected to exceed $3,000.

Relocate Signs

There are several signs located within the gore area at the diverge between ramps 6 & 7a. Some of these signs are related to ramp 6 while other are related to ramp 7a. The City could consider making the following adjustments as illustrated in **Figure 29**:

+ Relocate the merge sign from the wood post to the luminaire pole (it is related to ramp 6, not important for ramp 7a);
+ Relocate the exit sign closer to the area where the grass begins; and
+ Relocate the Linc sign further down the ramp or combine with the upstream RHVP sign.

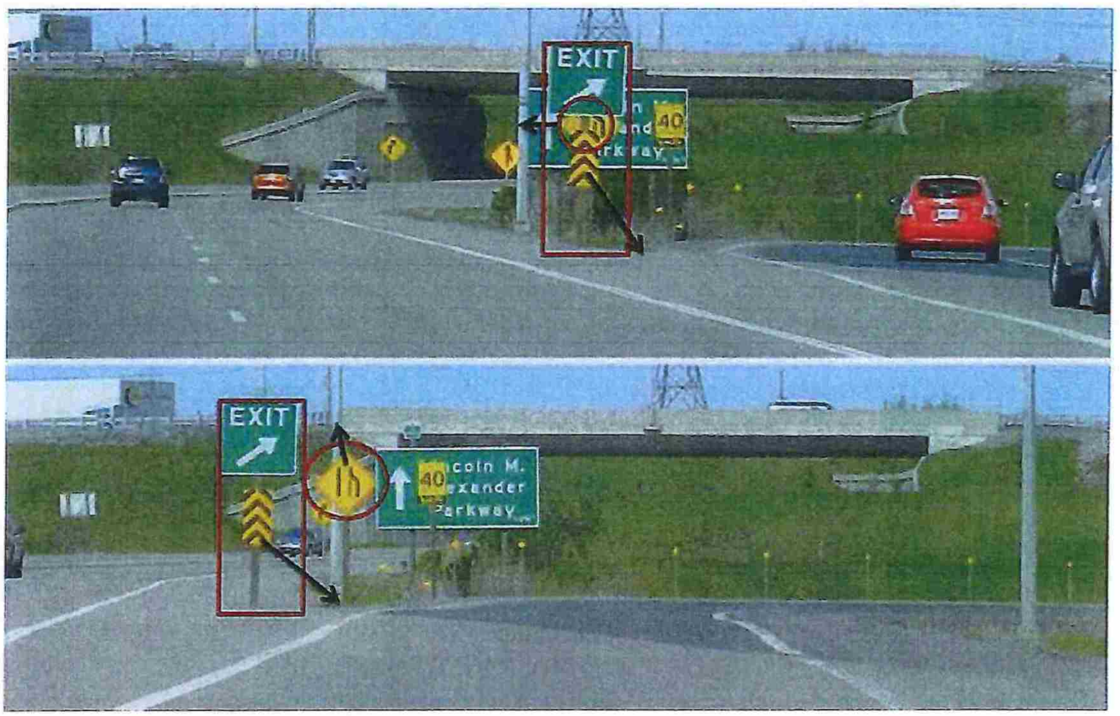

Figure 29 - Possible Signage Adjustments

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $2,000.

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6.3.10 Ramp 7a & 7b

Similar to other sites, this ramp was has a very high proportion of SMV (80%), wet surface and non-daylight collisions, and was found to have a PSI. The field review noted evidence of run off the road collisions, as well as some closely spaced and back-dropped signage at the diverge point from Ramp 6 and an inappropriate merge sign.

Illumination

The outcome of the TAC illumination warrant indicated that illumination of the ramp is justified, however it is not being recommended at this time as the cost to install and maintain the illumination is much greater than the calculated benefit.

COST-BENEFIT RATIO

The CMF used for this assessment was 0.6 and is related to all types of nighttime collisions. The expected service life for this countermeasure is 20 years. A total benefit of $107,010 and costs of $550,000 for a B/C ratio of 0.19 was calculated.

Relocate Signs as per Ramp 6

The changes to the signage discussed for ramp 6 are directly applicable to ramp 7a.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $2,000, but would only need to be done once (i.e. through ramp 6).

Replace Merge Sign with Lane Ends Sign

The Merge warning sign on approach to the Stone Church Road East S-N on-ramp is inappropriate for the configuration. The driver on the E-N ramp is the one who is merging onto the S-N ramp. This sign indicates that another lane is joining from the right and could cause driver confusion. A Lane Ends warning sign is required, as opposed to the Merge warning sign. The City could consider replacing the merge sign with a Wa-123 Lane Ends sign.

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $500 so we recommend implementing this countermeasure.

6.3.11 Ramp 8

The collision review indicated a positive PSI for this ramp; however the actual number of observed collisions is low. The field review highlighted the need for some sign rationalization throughout the ramp.

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Illumination

The outcome of the TAC illumination warrant indicated that illumination of the ramp is justified, however it is not being recommended at this time as the cost to install and maintain the illumination is much greater than the calculated benefit.

COST-BENEFIT RATIO

The CMF used for this assessment was 0.6 and is related to all types of nighttime collisions. The expected service life for this countermeasure is 20 years. A total benefit of $233,663 and costs of $275,000 for a B/C ratio of 0.85 was calculated.

Replace Road Name Signs with Advance Diagrammatic Sign

Small information signs indicating that the left lane leads to Mud Street and the right lane leads to Stone Church Road are located approximately 160 metres upstream of the forced diverge point for Mud Street and Stone Church Road, are directly behind curve warning signs and immediately before a curve. Since the information signs are small there is a good chance that a driver will not detect them. If the small information signs are missed the next available signage to inform road users of the appropriate lane decision are located at the diverge point. However, similar to the previous information signs, given the horizontal curvature of the ramp, the signs are not visible in advance of their placement and sudden lane changes, and potentially related conflicts, may occur in this area. To assist drivers, the City could consider installing a ground mounted advance diagrammatic sign (similar to example in **Figure 30**) on the right side of the road in the location of the existing small signs.

Figure 30 - Example of Diagrammatic Sign

COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $5,000.

Install Consistent Curve Warning Signage

The curve warning signs on either side of the road on the off-ramp provide inconsistent information regarding the severity of the curve. It is important that consistent and appropriate warning the severity of a curve be provided to a driver in order to assist them in making the appropriate decisions to safety navigate through the curve. It appears that the sign on the left is attempting to indicate that the left lane has a tighter radius than the right lane. The City could consider installing consistent and appropriate curve warning signs.

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COST-BENEFIT RATIO

There is no CMF for this countermeasure; however, costs are not expected to exceed $1,000.

6.3.12 Ramps 9 & 10

There were no major collision or field findings for these ramps, although they indicate a positive PSI, the number of collisions is very low.

6.4 Summary of Potential Countermeasures and B/C Ratios

Table 11 summarizes the countermeasures and b/c ratios for the overall study area, **Table 12** summarizes the same information for road segments and **Table 13** summarizes the same information for ramps.

The recommended timing for implementation of each of the countermeasures is also provided in the tables. The terms for implementation have been considered as:

- Short Term (ST) = 0 – 5 years;
- Medium Term (MT) = 5 – 10 years; and
- Long Term (LT) = 10+ years.

These recommendations have been provided based on each or a combination of the following rational:

- The cost of the countermeasure;
- The benefit of the countermeasure;
- The ease of implementation; and/or
- The importance of implementation.

Table 11 - Summary of Countermeasures & B/C for Overall Study Area

Countermeasure	B/C Ratio	Cost	Timing
Friction Testing	n/a	$10,000	ST
PRPM or	3.29	$75,000	ST
Inverted Profile Markings	n/a	n/a*	ST
Wide Markings	3.39	$40,000	ST
Slippery When Wet Signs	n/a	$5,000	ST
Enforcement of Travel Speeds	n/a	n/a	ST
Trailblazer Signage	n/a	$2,000	ST
Remove Lane Exit Signs	n/a	$1,000	ST
Total Costs		$133k	

*Costs for this countermeasure were not readily available for inclusion in this report

Table 12 - Summary of Countermeasures & B/C for Road Segments

Name	Road Segment	Collisions	Field	Countermeasure	B/C Ratio	Cost	Term
West of Dartnall	Dartnall 1 & 2	None	No major findings	n/a	n/a	n/a	n/a
Between Dartnall & Mud	Dartnall 3, 4 & 5	48% SMV	Potentially restricted sightlines for merging traffic from Dartnall onto NB RHVP	Extend solid white line from gore	n/a	$500	ST
			Exit information sign partially obscured NB RHVP	Remove Deer Warning sign	n/a	$500	ST

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RHV0001045

Name	Road Segment	Collisions	Field	Countermeasure	B/C Ratio	Cost	Term
			Change in alignment in SB direction	Alter SB alignment with pavement markings & alteration to rumble strips & possibly to the shoulder	n/a	$4,000*	ST
Between Mud & Greenhill	Mud 1, 2 & 3	60% SMV 50% non-daylight	Uneven terrain in front of guiderail NB	Flatten terrain or raise guiderail NB	n/a	n/a**	ST
	Mud 4, 5 & 6	**Exp. >. Pred. @ Mud 4** Primarily SMV High proportion of non-daylight & wet surface	Closely spaced & obscured signage at critical decision points SB	Relocate "ENGINE BRAKES" sign NB	n/a	$500	ST
			Potentially confusing "keep right" sign NB	Remove "Slower Traffic" sign SB	n/a	$500	ST
			Closely spaced & obscured signage at critical decision points NB	Place "Object Marker" sign on same post as "Exit" sign SB	n/a	$500	ST
	Greenhill 1 to 4	None	No major findings	n/a	n/a	n/a	n/a
Total Costs						$6,500***	

* Cost is for pavement markings only. Other potential required works could increase cost substantially

**It is expected that this countermeasure could be completed by City forces

***Not including other potential works associated with the alignment adjustment

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Table 13 - Summary of Countermeasures & B/C for Ramps

Name	Ramp	Collisions	Field	Countermeasure	B/C Ratio	Cost	Term
Dartnall Int.	Ramp 1 & 2	n/a	Culvert and drop-off within deflection area of approach eccentric loader end treatment (Ramp 2)	End guiderail and change end treatment	n/a	$11,000	ST
	Ramp 3	n/a	No major findings	n/a	n/a	n/a	n/a
	Ramp 4	n/a	No major findings	n/a	n/a	n/a	n/a
Mud Int.	Ramp 5		Lane ends within curve	Restripe to one lane for each ramp	n/a	$8,000	MT
	Ramp 6	**Exp. > Pred.**; 65% of all ramp collisions; High proportion & frequency of SMV, non-daylight & wet surface	TAC illumination warrant justified	Install lighting on ramp	3.78	$275,000	ST
			Closely spaced / eclipsing signage at diverge point; Evidence of lane departures	Install high-friction pavement approaching and through curve	2.32	$93,000	ST
				Install progressively larger chevrons	n/a	$4,000	ST
				Install pavement marking text	n/a	$1,500	ST
				Install dynamic / variable speed warning sign	n/a	$7,000	ST
				Install flashing amber beacons on signs	n/a	$3,000	ST

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RHV0001045

Name	Ramp	Collisions	Field	Countermeasure	B/C Ratio	Cost	Term
				Relocate signs	n/a	$2,000	ST
	Ramp 7a 7 7b	Exp. > Pred. 80% of collisions SMV High proportion of non-daylight & wet surface	Closely spaced & back dropped signage at diverge	Relocate signs	n/a	$2,000	ST
			Inappropriate merge sign	Replace merge sign with Wa-123 Lane Ends sign	n/a	$500	ST
	Ramp 8	Exp. > Pred., however very low # of collisions	Size of information signs	Replace road name information signs with advance diagrammatic sign	n/a	$5,000	ST
			Inconsistent curve warning signs	Install consistent curve warning signage	n/a	1,000	ST
Greenhill Int.	Ramp 9	Exp. > Pred., however very low # of collisions	No major findings	n/a	n/a	n/a	n/a
	Ramp 10	Exp. > Pred., however very low # of collisions	No major findings	n/a	n/a	n/a	n/a
Total Costs					ST = $405,000 MT = $8,000		

APPENDIX A

Safety Performance Functions Parameters

And

Calibration Factors

Freeway Model Calibration Factors and Default Values

Freeway Fatal-and-Injury Crash Frequency Models

Model: $\exp(a + b \ln[c\ AADT_{fs}])\ L$

Area Type	Through Lanes	Model	Location	a	b	c	Inverse Disp. (K), mi	Calib. Factor (C)
Rural	4	Multiple-vehicle	Freeway segment	-5.975	1.492	0.001	17.60	1.00
		Single-vehicle	Freeway segment	-2.126	0.646	0.001	30.10	1.00
		Ramp-entrance	Speed-change lane	-3.894	1.173	0.0005	26.10	1.00
		Ramp-exit	Speed-change lane	-2.679	0.903	0.0005	1.78	1.00
	6	Multiple-vehicle	Freeway segment	-6.092	1.492	0.001	17.60	1.00
		Single-vehicle	Freeway segment	-2.055	0.646	0.001	30.10	1.00
		Ramp-entrance	Speed-change lane	-4.154	1.173	0.0005	26.10	1.00
		Ramp-exit	Speed-change lane	-2.679	0.903	0.0005	1.78	1.00
	8	Multiple-vehicle	Freeway segment	-6.140	1.492	0.001	17.60	1.00
		Single-vehicle	Freeway segment	-1.985	0.646	0.001	30.10	1.00
		Ramp-entrance	Speed-change lane	-4.414	1.173	0.0005	26.10	1.00
		Ramp-exit	Speed-change lane	-2.679	0.903	0.0005	1.78	1.00
Urban	4	Multiple-vehicle	Freeway segment	-5.470	1.492	0.001	17.60	1.00
		Single-vehicle	Freeway segment	-2.126	0.646	0.001	30.10	1.00
		Ramp-entrance	Speed-change lane	-3.714	1.173	0.0005	26.10	1.00
		Ramp-exit	Speed-change lane	-2.679	0.903	0.0005	1.78	1.00
	6	Multiple-vehicle	Freeway segment	-5.587	1.492	0.001	17.60	1.00
		Single-vehicle	Freeway segment	-2.055	0.646	0.001	30.10	1.00
		Ramp-entrance	Speed-change lane	-3.974	1.173	0.0005	26.10	1.00
		Ramp-exit	Speed-change lane	-2.679	0.903	0.0005	1.78	1.00
	8	Multiple-vehicle	Freeway segment	-5.635	1.492	0.001	17.60	1.00
		Single-vehicle	Freeway segment	-1.985	0.646	0.001	30.10	1.00
		Ramp-entrance	Speed-change lane	-4.234	1.173	0.0005	26.10	1.00
		Ramp-exit	Speed-change lane	-2.679	0.903	0.0005	1.78	1.00
	10	Multiple-vehicle	Freeway segment	-5.842	1.492	0.001	17.60	1.00
		Single-vehicle	Freeway segment	-1.915	0.646	0.001	30.10	1.00
		Ramp-entrance	Speed-change lane	-4.494	1.173	0.0005	26.10	1.00
		Ramp-exit	Speed-change lane	-2.679	0.903	0.0005	1.78	1.00

Freeway Property-Damage-Only Crash Frequency Models

Model: $\exp(a + b \ln[c\ AADT_{fs}])\ L$

Area Type	Through Lanes	Model	Location	a	b	c	Inverse Disp. (K), mi	Calib. Factor (C)
Rural	4	Multiple-vehicle	Freeway segment	-6.880	1.936	0.001	18.80	1.00
		Single-vehicle	Freeway segment	-2.235	0.876	0.001	20.70	1.00
		Ramp-entrance	Speed-change lane	-2.895	1.215	0.0005	24.80	1.00
		Ramp-exit	Speed-change lane	-1.798	0.932	0.0005	1.58	1.00
	6	Multiple-vehicle	Freeway segment	-7.141	1.936	0.001	18.80	1.00
		Single-vehicle	Freeway segment	-2.274	0.876	0.001	20.70	1.00
		Ramp-entrance	Speed-change lane	-3.097	1.215	0.0005	24.80	1.00
		Ramp-exit	Speed-change lane	-1.798	0.932	0.0005	1.58	1.00
	8	Multiple-vehicle	Freeway segment	-7.329	1.936	0.001	18.80	1.00
		Single-vehicle	Freeway segment	-2.312	0.876	0.001	20.70	1.00
		Ramp-entrance	Speed-change lane	-3.299	1.215	0.0005	24.80	1.00
		Ramp-exit	Speed-change lane	-1.798	0.932	0.0005	1.58	1.00
Urban	4	Multiple-vehicle	Freeway segment	-6.548	1.936	0.001	18.80	1.00
		Single-vehicle	Freeway segment	-2.235	0.876	0.001	20.70	1.00
		Ramp-entrance	Speed-change lane	-2.796	1.215	0.0005	24.80	1.00
		Ramp-exit	Speed-change lane	-1.798	0.932	0.0005	1.58	1.00
	6	Multiple-vehicle	Freeway segment	-6.809	1.936	0.001	18.80	1.00
		Single-vehicle	Freeway segment	-2.274	0.876	0.001	20.70	1.00
		Ramp-entrance	Speed-change lane	-2.998	1.215	0.0005	24.80	1.00
		Ramp-exit	Speed-change lane	-1.798	0.932	0.0005	1.58	1.00
	8	Multiple-vehicle	Freeway segment	-6.997	1.936	0.001	18.80	1.00
		Single-vehicle	Freeway segment	-2.312	0.876	0.001	20.70	1.00
		Ramp-entrance	Speed-change lane	-3.200	1.215	0.0005	24.80	1.00
		Ramp-exit	Speed-change lane	-1.798	0.932	0.0005	1.58	1.00
	10	Multiple-vehicle	Freeway segment	-7.260	1.936	0.001	18.80	1.00
		Single-vehicle	Freeway segment	-2.351	0.876	0.001	20.70	1.00
		Ramp-entrance	Speed-change lane	-3.402	1.215	0.0005	24.80	1.00
		Ramp-exit	Speed-change lane	-1.798	0.932	0.0005	1.58	1.00

Freeway Crash Severity Model

Calibration factor	1.00

Freeway Crash Distribution

Area Type	Crash Type	Crash Type Category	Proportion of Crashes by Severity Level for Specific Models					
			Main Lanes		Ramp Entrance		Ramp Exit	
			FI	PDO	FI	PDO	FI	PDO
Rural	Multiple vehicle	Head-on	0.018	0.004	0.021	0.004	0.000	0.000
		Right-angle	0.056	0.030	0.032	0.013	0.015	0.000
		Rear-end	0.630	0.508	0.351	0.260	0.463	0.304
		Sideswipe	0.237	0.380	0.128	0.242	0.104	0.243
		Other multiple-vehicle crash	0.059	0.078	0.011	0.040	0.000	0.009
		MV Total:	1.000	1.000				
	Single vehicle	Crash with animal	0.010	0.065	0.000	0.009	0.000	0.061
		Crash with fixed object	0.567	0.625	0.245	0.296	0.224	0.235
		Crash with other object	0.031	0.125	0.021	0.070	0.030	0.061
		Crash with parked vehicle	0.024	0.023	0.021	0.000	0.000	0.017
		Other single-vehicle crash	0.368	0.162	0.170	0.066	0.164	0.070
		SV Total:	1.000	1.000				
		Total:			1.000	1.000	1.000	1.000
Urban	Multiple vehicle	Head-on	0.008	0.002	0.004	0.001	0.005	0.002
		Right-angle	0.031	0.018	0.019	0.016	0.011	0.012
		Rear-end	0.750	0.690	0.543	0.530	0.549	0.565
		Sideswipe	0.180	0.266	0.133	0.252	0.158	0.138
		Other multiple-vehicle crash	0.031	0.024	0.017	0.015	0.016	0.016
		MV Total:	1.000	1.000				
	Single vehicle	Crash with animal	0.004	0.022	0.000	0.002	0.000	0.007
		Crash with fixed object	0.722	0.716	0.194	0.129	0.196	0.207
		Crash with other object	0.051	0.139	0.019	0.036	0.016	0.030
		Crash with parked vehicle	0.015	0.016	0.004	0.003	0.000	0.000
		Other single-vehicle crash	0.208	0.107	0.067	0.016	0.049	0.023
		SV Total:	1.000	1.000				
		Total:			1.000	1.000	1.000	1.000

Ramp Segment Model Calibration Factors and Default Values

Ramp Segment Fatal-and-Injury Crash Frequency Models

Model: $\exp(a + b \ln[c\ AADT_r] + d\ [c\ AADT_r])\ L$

Area Type	Through Lanes	Number of Vehicles Involved	Location	a	b	c	d	Inverse Disp. (K), mi	Calib. Factor (C)
Rural	1	Multiple vehicle	Entrance	-5.226	0.524	0.001	0.0699	14.60	1.00
		Multiple vehicle	Exit	-6.692	0.524	0.001	0.0699	14.60	1.00
		Multiple vehicle	C-D road	-4.718	0.524	0.001	0.0699	14.60	1.00
		Single vehicle	Entrance	-2.120	0.718	0.001	0.0000	7.91	1.00
		Single vehicle	Exit	-1.799	0.718	0.001	0.0000	7.91	1.00
		Single vehicle	C-D road	-3.002	0.718	0.001	0.0000	7.91	1.00
Urban	1	Multiple vehicle	Entrance	-3.505	0.524	0.001	0.0699	14.60	1.00
		Multiple vehicle	Exit	-4.971	0.524	0.001	0.0699	14.60	1.00
		Multiple vehicle	C-D road	-2.997	0.524	0.001	0.0699	14.60	1.00
		Single vehicle	Entrance	-1.966	0.718	0.001	0.0000	7.91	1.00
		Single vehicle	Exit	-1.645	0.718	0.001	0.0000	7.91	1.00
		Single vehicle	C-D road	-2.848	0.718	0.001	0.0000	7.91	1.00
	2	Multiple vehicle	Entrance	-3.023	0.524	0.001	0.0699	14.60	1.00
		Multiple vehicle	Exit	-4.489	0.524	0.001	0.0699	14.60	1.00
		Multiple vehicle	C-D road	-2.515	0.524	0.001	0.0699	14.60	1.00
		Single vehicle	Entrance	-1.999	0.718	0.001	0.0000	7.91	1.00
		Single vehicle	Exit	-1.678	0.718	0.001	0.0000	7.91	1.00
		Single vehicle	C-D road	-2.881	0.718	0.001	0.0000	7.91	1.00

Ramp Segment Property-Damage-Only Crash Frequency Models

Model: $\exp(a + b \ln[c\ AADT_r] + d\ [c\ AADT_r])\ L$

Area Type	Through Lanes	Number of Vehicles Involved	Location	a	b	c	d	Inverse Disp. (K), mi	Calib. Factor (C)
Rural	1	Multiple vehicle	Entrance	-3.819	1.256	0.001	0.0000	12.70	1.00
		Multiple vehicle	Exit	-4.851	1.256	0.001	0.0000	12.70	1.00
		Multiple vehicle	C-D road	-3.311	1.256	0.001	0.0000	12.70	1.00
		Single vehicle	Entrance	-1.946	0.689	0.001	0.0000	9.77	1.00
		Single vehicle	Exit	-1.739	0.689	0.001	0.0000	9.77	1.00
		Single vehicle	C-D road	-2.890	0.689	0.001	0.0000	9.77	1.00
Urban	1	Multiple vehicle	Entrance	-3.819	1.256	0.001	0.0000	12.70	1.00
		Multiple vehicle	Exit	-4.851	1.256	0.001	0.0000	12.70	1.00
		Multiple vehicle	C-D road	-3.311	1.256	0.001	0.0000	12.70	1.00
		Single vehicle	Entrance	-1.715	0.689	0.001	0.0000	9.77	1.00
		Single vehicle	Exit	-1.508	0.689	0.001	0.0000	9.77	1.00
		Single vehicle	C-D road	-2.659	0.689	0.001	0.0000	9.77	1.00
	2	Multiple vehicle	Entrance	-2.983	1.256	0.001	0.0000	12.70	1.00
		Multiple vehicle	Exit	-4.015	1.256	0.001	0.0000	12.70	1.00
		Multiple vehicle	C-D road	-2.475	1.256	0.001	0.0000	12.70	1.00
		Single vehicle	Entrance	-1.400	0.689	0.001	0.0000	9.77	1.00
		Single vehicle	Exit	-1.193	0.689	0.001	0.0000	9.77	1.00
		Single vehicle	C-D road	-2.344	0.689	0.001	0.0000	9.77	1.00

Ramp Segment Crash Severity Model

Calibration factor	1.00

Ramp Segment Crash Distribution

Area Type	Crash Type	Crash Type Category	Proportion of Crashes by Severity Level for Specific Models: C-D Road FI	C-D Road PDO	Entrance Ramp FI	Entrance Ramp PDO	Exit Ramp FI	Exit Ramp PDO
Rural	Multiple vehicle	Head-on	0.015	0.009	0.015	0.009	0.015	0.009
		Right-angle	0.010	0.005	0.010	0.005	0.010	0.005
		Rear-end	0.707	0.550	0.707	0.550	0.707	0.550
		Sideswipe	0.129	0.335	0.129	0.335	0.129	0.335
		Other multiple-vehicle crash	0.139	0.101	0.139	0.101	0.139	0.101
		MV Total:	1.000	1.000	1.000	1.000	1.000	1.000
	Single vehicle	Crash with animal	0.012	0.022	0.012	0.022	0.012	0.022
		Crash with fixed object	0.422	0.538	0.422	0.538	0.422	0.538
		Crash with other object	0.000	0.011	0.000	0.011	0.000	0.011
		Crash with parked vehicle	0.024	0.055	0.024	0.055	0.024	0.055
		Other single-vehicle crash	0.542	0.374	0.542	0.374	0.542	0.374
		SV Total:	1.000	1.000	1.000	1.000	1.000	1.000
Urban	Multiple vehicle	Head-on	0.015	0.009	0.015	0.009	0.015	0.009
		Right-angle	0.010	0.005	0.010	0.005	0.010	0.005
		Rear-end	0.707	0.550	0.707	0.550	0.707	0.550
		Sideswipe	0.129	0.335	0.129	0.335	0.129	0.335
		Other multiple-vehicle crash	0.139	0.101	0.139	0.101	0.139	0.101
		MV Total:	1.000	1.000	1.000	1.000	1.000	1.000
	Single vehicle	Crash with animal	0.003	0.005	0.003	0.005	0.003	0.005
		Crash with fixed object	0.718	0.834	0.718	0.834	0.718	0.834
		Crash with other object	0.015	0.023	0.015	0.023	0.015	0.023
		Crash with parked vehicle	0.012	0.012	0.012	0.012	0.012	0.012
		Other single-vehicle crash	0.252	0.126	0.252	0.126	0.252	0.126
		SV Total:	1.000	1.000	1.000	1.000	1.000	1.000

Ramp Terminal Model Calibration Factors and Default Values									
Ramp Terminal Fatal-and-Injury Crash Frequency Models			Model: $\exp(a + b \ln[c\ AADT_{in}/2 + c\ AADT_{out}/2] + d \ln[c\ AADT_{ex} + c\ AADT_{en}])$						
Area Type	Terminal Config.	Control Type	Through Lanes	*a*	*b*	*c*	*d*	Inverse Disp. (*K*)	Calib. Factor (*C*)
Rural	D3ex	One-way stop	2	-2.899	0.582	0.001	0.899	2.16	1.00
			3	-2.899	0.582	0.001	0.899	2.16	1.00
			4	-2.899	0.582	0.001	0.899	2.16	1.00
		Signalized	2	-1.352	0.379	0.001	0.394	8.72	1.00
			3	-1.192	0.379	0.001	0.394	8.72	1.00
			4	-1.032	0.379	0.001	0.394	8.72	1.00
	D3en	One-way stop	2	-2.817	0.709	0.001	0.730	0.92	1.00
			3	-2.817	0.709	0.001	0.730	0.92	1.00
			4	-2.817	0.709	0.001	0.730	0.92	1.00
		Signalized	2	-2.068	0.265	0.001	0.905	5.37	1.00
			3	-1.908	0.265	0.001	0.905	5.37	1.00
			4	-1.748	0.265	0.001	0.905	5.37	1.00
	D4	One-way stop	2	-2.740	1.008	0.001	0.177	2.58	1.00
			3	-2.740	1.008	0.001	0.177	2.58	1.00
			4	-2.740	1.008	0.001	0.177	2.58	1.00
		Signalized	2	-2.655	1.191	0.001	0.131	11.50	1.00
			3	-2.495	1.191	0.001	0.131	11.50	1.00
			4	-2.335	1.191	0.001	0.131	11.50	1.00
	A4	One-way stop	2	-2.899	0.582	0.001	0.899	2.16	1.00
			3	-2.899	0.582	0.001	0.899	2.16	1.00
			4	-2.899	0.582	0.001	0.899	2.16	1.00
		Signalized	2	-1.352	0.379	0.001	0.394	8.72	1.00
			3	-1.192	0.379	0.001	0.394	8.72	1.00
			4	-1.032	0.379	0.001	0.394	8.72	1.00
	B4	One-way stop	2	-2.817	0.709	0.001	0.730	0.92	1.00
			3	-2.817	0.709	0.001	0.730	0.92	1.00
			4	-2.817	0.709	0.001	0.730	0.92	1.00
		Signalized	2	-2.068	0.265	0.001	0.905	5.37	1.00
			3	-1.908	0.265	0.001	0.905	5.37	1.00
			4	-1.748	0.265	0.001	0.905	5.37	1.00
	A2	One-way stop	2	-2.363	0.260	0.001	0.947	3.40	1.00
			3	-2.363	0.260	0.001	0.947	3.40	1.00
			4	-2.363	0.260	0.001	0.947	3.40	1.00
		Signalized	2	-0.458	0.325	0.001	0.212	2.17	1.00
			3	-0.298	0.325	0.001	0.212	2.17	1.00
			4	-0.138	0.325	0.001	0.212	2.17	1.00
	B2	One-way stop	2	-2.363	0.260	0.001	0.947	3.40	1.00
			3	-2.363	0.260	0.001	0.947	3.40	1.00
			4	-2.363	0.260	0.001	0.947	3.40	1.00
		Signalized	2	-0.458	0.325	0.001	0.212	2.17	1.00
			3	-0.298	0.325	0.001	0.212	2.17	1.00
			4	-0.138	0.325	0.001	0.212	2.17	1.00
Urban	D3ex	One-way stop	2	-3.223	0.582	0.001	0.899	2.16	1.00
			3	-3.223	0.582	0.001	0.899	2.16	1.00
			4	-3.223	0.582	0.001	0.899	2.16	1.00
		Signalized	2	-1.352	0.379	0.001	0.394	8.72	1.00
			3	-1.192	0.379	0.001	0.394	8.72	1.00
			4	-1.032	0.379	0.001	0.394	8.72	1.00
			5	-0.872	0.379	0.001	0.394	8.72	1.00
			6	-0.712	0.379	0.001	0.394	8.72	1.00
	D3en	One-way stop	2	-3.141	0.709	0.001	0.730	0.92	1.00
			3	-3.141	0.709	0.001	0.730	0.92	1.00
			4	-3.141	0.709	0.001	0.730	0.92	1.00
		Signalized	2	-2.068	0.265	0.001	0.905	5.37	1.00
			3	-1.908	0.265	0.001	0.905	5.37	1.00
			4	-1.748	0.265	0.001	0.905	5.37	1.00
			5	-1.588	0.265	0.001	0.905	5.37	1.00
			6	-1.428	0.265	0.001	0.905	5.37	1.00
	D4	One-way stop	2	-3.064	1.008	0.001	0.177	2.58	1.00
			3	-3.064	1.008	0.001	0.177	2.58	1.00
			4	-3.064	1.008	0.001	0.177	2.58	1.00
		Signalized	2	-2.655	1.191	0.001	0.131	11.50	1.00
			3	-2.495	1.191	0.001	0.131	11.50	1.00
			4	-2.335	1.191	0.001	0.131	11.50	1.00
			5	-2.175	1.191	0.001	0.131	11.50	1.00
			6	-2.015	1.191	0.001	0.131	11.50	1.00
	A4	One-way stop	2	-3.223	0.582	0.001	0.899	2.16	1.00
			3	-3.223	0.582	0.001	0.899	2.16	1.00
			4	-3.223	0.582	0.001	0.899	2.16	1.00
		Signalized	2	-1.352	0.379	0.001	0.394	8.72	1.00
			3	-1.192	0.379	0.001	0.394	8.72	1.00
			4	-1.032	0.379	0.001	0.394	8.72	1.00
			5	-0.872	0.379	0.001	0.394	8.72	1.00
			6	-0.712	0.379	0.001	0.394	8.72	1.00
	B4	One-way stop	2	-3.141	0.709	0.001	0.730	0.92	1.00
			3	-3.141	0.709	0.001	0.730	0.92	1.00
			4	-3.141	0.709	0.001	0.730	0.92	1.00
		Signalized	2	-2.068	0.265	0.001	0.905	5.37	1.00
			3	-1.908	0.265	0.001	0.905	5.37	1.00
			4	-1.748	0.265	0.001	0.905	5.37	1.00
			5	-1.588	0.265	0.001	0.905	5.37	1.00
			6	-1.428	0.265	0.001	0.905	5.37	1.00
	A2	One-way stop	2	-2.687	0.260	0.001	0.947	3.40	1.00
			3	-2.687	0.260	0.001	0.947	3.40	1.00
			4	-2.687	0.260	0.001	0.947	3.40	1.00
		Signalized	2	-0.458	0.325	0.001	0.212	2.17	1.00
			3	-0.298	0.325	0.001	0.212	2.17	1.00
			4	-0.138	0.325	0.001	0.212	2.17	1.00
			5	0.022	0.325	0.001	0.212	2.17	1.00
			6	0.182	0.325	0.001	0.212	2.17	1.00
	B2	One-way stop	2	-2.687	0.260	0.001	0.947	3.40	1.00
			3	-2.687	0.260	0.001	0.947	3.40	1.00
			4	-2.687	0.260	0.001	0.947	3.40	1.00
		Signalized	2	-0.458	0.325	0.001	0.212	2.17	1.00
			3	-0.298	0.325	0.001	0.212	2.17	1.00
			4	-0.138	0.325	0.001	0.212	2.17	1.00
			5	0.022	0.325	0.001	0.212	2.17	1.00
			6	0.182	0.325	0.001	0.212	2.17	1.00

Ramp Terminal Property-Damage-Only Crash Freq. Models	Model: $\exp(a + b \ln[c\,AADT_{in}/2 + c\,AADT_{out}/2] + d \ln[c\,AADT_{ex} + c\,AADT_{en}])$								
Area Type	Terminal Config.	Control Type	Through Lanes	*a*	*b*	*c*	*d*	Inverse Disp. (*K*)	Calib. Factor (*C*)
Rural	D3ex	One-way stop	2	-2.670	0.595	0.001	0.937	6.57	1.00
			3	-2.670	0.595	0.001	0.937	6.57	1.00
			4	-2.670	0.595	0.001	0.937	6.57	1.00
		Signalized	2	-2.247	0.797	0.001	0.384	4.05	1.00
			3	-2.159	0.797	0.001	0.384	4.05	1.00
			4	-2.071	0.797	0.001	0.384	4.05	1.00
	D3en	One-way stop	2	-2.358	0.885	0.001	0.350	3.90	1.00
			3	-2.358	0.885	0.001	0.350	3.90	1.00
			4	-2.358	0.885	0.001	0.350	3.90	1.00
		Signalized	2	-2.931	0.741	0.001	0.845	3.72	1.00
			3	-2.843	0.741	0.001	0.845	3.72	1.00
			4	-2.755	0.741	0.001	0.845	3.72	1.00
	D4	One-way stop	2	-2.432	0.845	0.001	0.476	4.27	1.00
			3	-2.432	0.845	0.001	0.476	4.27	1.00
			4	-2.432	0.845	0.001	0.476	4.27	1.00
		Signalized	2	-2.248	0.879	0.001	0.545	7.21	1.00
			3	-2.160	0.879	0.001	0.545	7.21	1.00
			4	-2.072	0.879	0.001	0.545	7.21	1.00
	A4	One-way stop	2	-2.670	0.595	0.001	0.937	6.57	1.00
			3	-2.670	0.595	0.001	0.937	6.57	1.00
			4	-2.670	0.595	0.001	0.937	6.57	1.00
		Signalized	2	-2.247	0.797	0.001	0.384	4.05	1.00
			3	-2.159	0.797	0.001	0.384	4.05	1.00
			4	-2.071	0.797	0.001	0.384	4.05	1.00
	B4	One-way stop	2	-2.358	0.885	0.001	0.350	3.90	1.00
			3	-2.358	0.885	0.001	0.350	3.90	1.00
			4	-2.358	0.885	0.001	0.350	3.90	1.00
		Signalized	2	-2.931	0.741	0.001	0.845	3.72	1.00
			3	-2.843	0.741	0.001	0.845	3.72	1.00
			4	-2.755	0.741	0.001	0.845	3.72	1.00
	A2	One-way stop	2	-3.055	0.773	0.001	0.878	5.49	1.00
			3	-3.055	0.773	0.001	0.878	5.49	1.00
			4	-3.055	0.773	0.001	0.878	5.49	1.00
		Signalized	2	-1.537	0.592	0.001	0.516	4.27	1.00
			3	-1.449	0.592	0.001	0.516	4.27	1.00
			4	-1.361	0.592	0.001	0.516	4.27	1.00
	B2	One-way stop	2	-3.055	0.773	0.001	0.878	5.49	1.00
			3	-3.055	0.773	0.001	0.878	5.49	1.00
			4	-3.055	0.773	0.001	0.878	5.49	1.00
		Signalized	2	-1.537	0.592	0.001	0.516	4.27	1.00
			3	-1.449	0.592	0.001	0.516	4.27	1.00
			4	-1.361	0.592	0.001	0.516	4.27	1.00
Urban	D3ex	One-way stop	2	-2.670	0.595	0.001	0.937	6.57	1.00
			3	-2.670	0.595	0.001	0.937	6.57	1.00
			4	-2.670	0.595	0.001	0.937	6.57	1.00
		Signalized	2	-2.247	0.797	0.001	0.384	4.05	1.00
			3	-2.159	0.797	0.001	0.384	4.05	1.00
			4	-2.071	0.797	0.001	0.384	4.05	1.00
			5	-1.984	0.797	0.001	0.384	4.05	1.00
			6	-1.896	0.797	0.001	0.384	4.05	1.00
	D3en	One-way stop	2	-2.358	0.885	0.001	0.350	3.90	1.00
			3	-2.358	0.885	0.001	0.350	3.90	1.00
			4	-2.358	0.885	0.001	0.350	3.90	1.00
		Signalized	2	-2.931	0.741	0.001	0.845	3.72	1.00
			3	-2.843	0.741	0.001	0.845	3.72	1.00
			4	-2.755	0.741	0.001	0.845	3.72	1.00
			5	-2.668	0.741	0.001	0.845	3.72	1.00
			6	-2.580	0.741	0.001	0.845	3.72	1.00
	D4	One-way stop	2	-2.432	0.845	0.001	0.476	4.27	1.00
			3	-2.432	0.845	0.001	0.476	4.27	1.00
			4	-2.432	0.845	0.001	0.476	4.27	1.00
		Signalized	2	-2.248	0.879	0.001	0.545	7.21	1.00
			3	-2.160	0.879	0.001	0.545	7.21	1.00
			4	-2.072	0.879	0.001	0.545	7.21	1.00
			5	-1.985	0.879	0.001	0.545	7.21	1.00
			6	-1.897	0.879	0.001	0.545	7.21	1.00
	A4	One-way stop	2	-2.670	0.595	0.001	0.937	6.57	1.00
			3	-2.670	0.595	0.001	0.937	6.57	1.00
			4	-2.670	0.595	0.001	0.937	6.57	1.00
		Signalized	2	-2.247	0.797	0.001	0.384	4.05	1.00
			3	-2.159	0.797	0.001	0.384	4.05	1.00
			4	-2.071	0.797	0.001	0.384	4.05	1.00
			5	-1.984	0.797	0.001	0.384	4.05	1.00
			6	-1.896	0.797	0.001	0.384	4.05	1.00
	B4	One-way stop	2	-2.358	0.885	0.001	0.350	3.90	1.00
			3	-2.358	0.885	0.001	0.350	3.90	1.00
			4	-2.358	0.885	0.001	0.350	3.90	1.00
		Signalized	2	-2.931	0.741	0.001	0.845	3.72	1.00
			3	-2.843	0.741	0.001	0.845	3.72	1.00
			4	-2.755	0.741	0.001	0.845	3.72	1.00
			5	-2.668	0.741	0.001	0.845	3.72	1.00
			6	-2.580	0.741	0.001	0.845	3.72	1.00
	A2	One-way stop	2	-3.055	0.773	0.001	0.878	5.49	1.00
			3	-3.055	0.773	0.001	0.878	5.49	1.00
			4	-3.055	0.773	0.001	0.878	5.49	1.00
		Signalized	2	-1.537	0.592	0.001	0.516	4.27	1.00
			3	-1.449	0.592	0.001	0.516	4.27	1.00
			4	-1.361	0.592	0.001	0.516	4.27	1.00
			5	-1.274	0.592	0.001	0.516	4.27	1.00
			6	-1.186	0.592	0.001	0.516	4.27	1.00
	B2	One-way stop	2	-3.055	0.773	0.001	0.878	5.49	1.00
			3	-3.055	0.773	0.001	0.878	5.49	1.00
			4	-3.055	0.773	0.001	0.878	5.49	1.00
		Signalized	2	-1.537	0.592	0.001	0.516	4.27	1.00
			3	-1.449	0.592	0.001	0.516	4.27	1.00
			4	-1.361	0.592	0.001	0.516	4.27	1.00
			5	-1.274	0.592	0.001	0.516	4.27	1.00
			6	-1.186	0.592	0.001	0.516	4.27	1.00

Ramp Terminal Crash Severity Model

Calibration factor for signal-controlled terminals: 1.00 Calibration factor for one-way stop-controlled terminals: 1.00

Ramp Terminal Crash Distribution

Area Type	Crash Type	Crash Type Category	Proportion of Crashes by Severity Level for Specific Models					
			Signalized		One-Way Stop		All-Way Stop	
			FI	PDO	FI	PDO	FI	PDO
Rural	Multiple vehicle	Head-on	0.000	0.006	0.020	0.015	0.000	0.000
		Right-angle	0.333	0.187	0.522	0.372	0.500	0.375
		Rear-end	0.552	0.466	0.275	0.276	0.500	0.405
		Sideswipe	0.000	0.219	0.020	0.107	0.000	0.094
		Other multiple-vehicle crash	0.014	0.013	0.013	0.026	0.000	0.000
	Single vehicle	Crash with animal	0.000	0.000	0.000	0.000	0.000	0.000
		Crash with fixed object	0.043	0.077	0.078	0.158	0.000	0.063
		Crash with other object	0.000	0.000	0.000	0.005	0.000	0.000
		Crash with parked vehicle	0.000	0.013	0.007	0.015	0.000	0.000
		Other single-vehicle crash	0.058	0.019	0.065	0.026	0.000	0.063
		Total:	1.000	1.000	1.000	1.000	1.000	1.000
Urban	Multiple vehicle	Head-on	0.011	0.007	0.017	0.012	0.000	0.000
		Right-angle	0.260	0.220	0.458	0.378	0.182	0.333
		Rear-end	0.625	0.543	0.373	0.377	0.727	0.500
		Sideswipe	0.042	0.149	0.025	0.079	0.000	0.000
		Other multiple-vehicle crash	0.009	0.020	0.017	0.016	0.000	0.000
	Single vehicle	Crash with animal	0.000	0.000	0.000	0.000	0.000	0.000
		Crash with fixed object	0.033	0.050	0.085	0.110	0.000	0.167
		Crash with other object	0.001	0.002	0.000	0.000	0.000	0.000
		Crash with parked vehicle	0.001	0.002	0.000	0.008	0.000	0.000
		Other single-vehicle crash	0.018	0.007	0.025	0.020	0.091	0.000
		Total:	1.000	1.000	1.000	1.000	1.000	1.000

APPENDIX

CS erational Analysis esults

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*HG*	Highway/Direction of Travel	*RHVP 1EB Mainline*
Agency or Company	*CIMA*	From/To	*Dartnall Interchange*
Date Performed	*23/07/2013*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2013*

Project Description *Redhill Safety Study*

⊖ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*2880*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

<u>Operational (LOS)</u>

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1554*	pc/h/ln
S	*71.6*	mph
D = v_p / S	*21.7*	pc/mi/ln
LOS	*C*	

Design (N)

<u>Design (N)</u>

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*HG*	Highway/Direction of Travel	*RHVP 1EB Mainline*
Agency or Company	*CIMA*	From/To	*Dartnall Interchange*
Date Performed	*23/07/2013*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2013*

Project Description *Redhill Safety Study*

⊖ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*2864*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs			**Calc Speed Adj and FFS**		
Lane Width	*12.0*	ft			
Rt-Side Lat. Clearance	*6.0*	ft	f_{LW}	*0.0*	mph
Number of Lanes, N	*2*		f_{LC}	*0.0*	mph
Total Ramp Density, TRD	*0.50*	ramps/mi	TRD Adjustment	*1.8*	mph
FFS (measured)		mph	FFS	*73.6*	mph
Base free-flow Speed, BFFS	*75.4*	mph			

LOS and Performance Measures			**Design (N)**	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1545*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*71.7*	mph	S	mph
D = v_p / S	*21.5*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		**Factor Location**	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*HG*	Highway/Direction of Travel	*RHVP 1WB Mainline*
Agency or Company	*CIMA*	From/To	*Dartnall Interchange*
Date Performed	*23/07/2013*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2013*

Project Description *Redhill Safety Study*

⊖ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*2866*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1546*	pc/h/ln
S	*71.7*	mph
D = v_p / S	*21.6*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

- N - Number of lanes
- V - Hourly volume
- v_p - Flow rate
- LOS - Level of service
- DDHV - Directional design hour volume
- S - Speed
- D - Density
- FFS - Free-flow speed
- BFFS - Base free-flow speed

Factor Location

- E_R - Exhibits 11-10, 11-12
- E_T - Exhibits 11-10, 11-11, 11-13
- f_p - Page 11-18
- LOS, S, FFS, v_p - Exhibits 11-2, 11-3
- f_{LW} - Exhibit 11-8
- f_{LC} - Exhibit 11-9
- TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*HG*	Highway/Direction of Travel	*RHVP 1WB Mainline*
Agency or Company	*CIMA*	From/To	*Dartnall Interchange*
Date Performed	*23/07/2013*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2013*

Project Description *Redhill Safety Study*

◉ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*3100*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft			
Rt-Side Lat. Clearance	*6.0*	ft	f_{LW}	*0.0*	mph
Number of Lanes, N	*2*		f_{LC}	*0.0*	mph
Total Ramp Density, TRD	*0.50*	ramps/mi	TRD Adjustment	*1.8*	mph
FFS (measured)		mph	FFS	*73.6*	mph
Base free-flow Speed, BFFS	*75.4*	mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1672*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*70.0*	mph	S	mph
D = v_p / S	*23.9*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*C*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	HG	Highway/Direction of Travel	RHVP 2EB Mainline
Agency or Company	CIMA	From/To	Dartnall Interchange
Date Performed	23/07/2013	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2013

Project Description *Redhill Safety Study*

⊝ Oper.(LOS) o Des.(N) o Planning Data

Flow Inputs

Volume, V	2766	veh/h	Peak-Hour Factor, PHF	0.95
AADT		veh/day	%Trucks and Buses, P_T	5
Peak-Hr Prop. of AADT, K			%RVs, P_R	0
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
			Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.976

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	0.50	ramps/mi	TRD Adjustment	1.8	mph
FFS (measured)		mph	FFS	73.6	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)		
Operational (LOS)			Design (N)		
			Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1492	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S	72.3	mph	S		mph
D = v_p / S	20.6	pc/mi/ln	D = v_p / S		pc/mi/ln
LOS	C		Required Number of Lanes, N		

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	*HG*	Highway/Direction of Travel	*RHVP 2EB Mainline*
Agency or Company	*CIMA*	From/To	*Dartnall Interchange*
Date Performed	*23/07/2013*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2013*

Project Description *Redhill Safety Study*

◉ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*2214* veh/h		Peak-Hour Factor, PHF	*0.95*
AADT	veh/day		%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D	veh/h		Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	*12.0*	ft			
Rt-Side Lat. Clearance	*6.0*	ft	f_{LW}	*0.0*	mph
Number of Lanes, N	*2*		f_{LC}	*0.0*	mph
Total Ramp Density, TRD	*0.50*	ramps/mi	TRD Adjustment	*1.8*	mph
FFS (measured)		mph	FFS	*73.6*	mph
Base free-flow Speed, BFFS	*75.4*	mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1194*	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	*74.6*	mph	S	mph
D = v_p / S	*16.0*	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	*B*		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*HG*	Highway/Direction of Travel	*RHVP 2WB Mainline*
Agency or Company	*CIMA*	From/To	*Dartnall Interchange*
Date Performed	*23/07/2013*	Jurisdiction	
Analysis Time Period	*AM Peak*	Analysis Year	*2013*

Project Description *Redhill Safety Study*

⊖ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*3075*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length Up/Down %	*mi*

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

<u>Operational (LOS)</u>

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1106*	pc/h/ln
S	*74.9*	mph
D = v_p / S	*14.8*	pc/mi/ln
LOS	*B*	

Design (N)

<u>Design (N)</u>

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		**Site Information**	
Analyst	*HG*	Highway/Direction of Travel	*RHVP 2WB Mainline*
Agency or Company	*CIMA*	From/To	*Dartnall Interchange*
Date Performed	*23/07/2013*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2013*

Project Description *Redhill Safety Study*

Oper.(LOS) Des.(N) Planning Data

Flow Inputs

Volume, V	*3376*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1214*	pc/h/ln
S	*74.5*	mph
D = v_p / S	*16.3*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*HG*
Agency or Company	*CIMA*
Date Performed	*23/07/2013*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*RHVP 4NB Mainline*
From/To	*Dartnall Interchange*
Jurisdiction	
Analysis Year	*2013*

Project Description *Redhill Safety Study*

⊖ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*3846*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2075*	pc/h/ln
S	*62.2*	mph
D = v_p / S	*33.4*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes	S - Speed
V - Hourly volume	D - Density
v_p - Flow rate	FFS - Free-flow speed
LOS - Level of service	BFFS - Base free-flow speed
DDHV - Directional design hour volume	

Factor Location

E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
f_p - Page 11-18	TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3	

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*HG*
Agency or Company	*CIMA*
Date Performed	*23/07/2013*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*RHVP 4NB Mainline*
From/To	*Dartnall Interchange*
Jurisdiction	
Analysis Year	*2013*

Project Description *Redhill Safety Study*

⊖ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*3007* veh/h		Peak-Hour Factor, PHF	*0.95*
AADT	veh/day		%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D	veh/h		Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1622*	pc/h/ln
S	*70.7*	mph
D = v_p / S	*22.9*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	HG	Highway/Direction of Travel	RHVP 4SB Mainline
Agency or Company	CIMA	From/To	Dartnall Interchange
Date Performed	23/07/2013	Jurisdiction	
Analysis Time Period	AM Peak	Analysis Year	2013

Project Description *Redhill Safety Study*

◉ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs				
Volume, V	2194	veh/h	Peak-Hour Factor, PHF	0.95
AADT		veh/day	%Trucks and Buses, P_T	5
Peak-Hr Prop. of AADT, K			%RVs, P_R	0
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
			Up/Down %	

Calculate Flow Adjustments			
f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.976

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	3		f_{LC}	0.0	mph
Total Ramp Density, TRD	0.50	ramps/mi	TRD Adjustment	1.8	mph
FFS (measured)		mph	FFS	73.6	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	789	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	75.0	mph	S	mph
D = v_p / S	10.5	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	A		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information		*Site Information*	
Analyst	*HG*	Highway/Direction of Travel	*RHVP 4SB Mainline*
Agency or Company	*CIMA*	From/To	*Dartnall Interchange*
Date Performed	*23/07/2013*	Jurisdiction	
Analysis Time Period	*PM Peak*	Analysis Year	*2013*

Project Description *Redhill Safety Study*

⊖ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*2770*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T-1)+P_R(E_R-1)]$	*0.976*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*996*	pc/h/ln
S	*75.0*	mph
D = v_p / S	*13.3*	pc/mi/ln
LOS	*B*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
S - Speed
V - Hourly volume
D - Density
v_p - Flow rate
FFS - Free-flow speed
LOS - Level of service
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
f_{LW} - Exhibit 11-8
E_T - Exhibits 11-10, 11-11, 11-13
f_{LC} - Exhibit 11-9
f_p - Page 11-18
TRD - Page 11-11
LOS, S, FFS, v_p - Exhibits 11-2, 11-3

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*HG*
Agency or Company	*CIMA*
Date Performed	*23/07/2013*
Analysis Time Period	*AM Peak*

Site Information

Highway/Direction of Travel	*RHVP 5NB Mainline*
From/To	*Dartnall Interchange*
Jurisdiction	
Analysis Year	*2013*

Project Description *Redhill Safety Study*

⊖ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	*3798*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	*mi*
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	*0.976*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*2*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*2049*	pc/h/ln
S	*62.8*	mph
D = v_p / S	*32.6*	pc/mi/ln
LOS	*D*	

Design (N)

Design (N)

Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	mph
D = v_p / S	pc/mi/ln
Required Number of Lanes, N	

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

BASIC FREEWAY SEGMENTS WORKSHEET

General Information		Site Information	
Analyst	HG	Highway/Direction of Travel	RHVP 5NB Mainline
Agency or Company	CIMA	From/To	Dartnall Interchange
Date Performed	23/07/2013	Jurisdiction	
Analysis Time Period	PM Peak	Analysis Year	2013

Project Description *Redhill Safety Study*

☉ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	2719	veh/h	Peak-Hour Factor, PHF	0.95
AADT		veh/day	%Trucks and Buses, P_T	5
Peak-Hr Prop. of AADT, K			%RVs, P_R	0
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
			Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.976

Speed Inputs			Calc Speed Adj and FFS		
Lane Width	12.0	ft			
Rt-Side Lat. Clearance	6.0	ft	f_{LW}	0.0	mph
Number of Lanes, N	2		f_{LC}	0.0	mph
Total Ramp Density, TRD	0.50	ramps/mi	TRD Adjustment	1.8	mph
FFS (measured)		mph	FFS	73.6	mph
Base free-flow Speed, BFFS	75.4	mph			

LOS and Performance Measures			Design (N)	
Operational (LOS)			Design (N)	
			Design LOS	
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	1467	pc/h/ln	v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	pc/h/ln
S	72.6	mph	S	mph
D = v_p / S	20.2	pc/mi/ln	D = v_p / S	pc/mi/ln
LOS	C		Required Number of Lanes, N	

Glossary		Factor Location	
N - Number of lanes	S - Speed	E_R - Exhibits 11-10, 11-12	f_{LW} - Exhibit 11-8
V - Hourly volume	D - Density	E_T - Exhibits 11-10, 11-11, 11-13	f_{LC} - Exhibit 11-9
v_p - Flow rate	FFS - Free-flow speed	f_p - Page 11-18	TRD - Page 11-11
LOS - Level of service	BFFS - Base free-flow speed	LOS, S, FFS, v_p - Exhibits 11-2, 11-3	
DDHV - Directional design hour volume			

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BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	HG
Agency or Company	CIMA
Date Performed	23/07/2013
Analysis Time Period	AM Peak

Site Information

Highway/Direction of Travel	RHVP 5SB Mainline
From/To	Dartnall Interchange
Jurisdiction	
Analysis Year	2013

Project Description *Redhill Safety Study*

⊖ Oper.(LOS) ○ Des.(N) ○ Planning Data

Flow Inputs

Volume, V	2669	veh/h	Peak-Hour Factor, PHF	0.95
AADT		veh/day	%Trucks and Buses, P_T	5
Peak-Hr Prop. of AADT, K			%RVs, P_R	0
Peak-Hr Direction Prop, D			General Terrain:	Level
DDHV = AADT x K x D		veh/h	Grade % Length	mi
			Up/Down %	

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	$f_{HV} = 1/[1+P_T(E_T - 1) + P_R(E_R - 1)]$	0.976

Speed Inputs

Lane Width	12.0	ft
Rt-Side Lat. Clearance	6.0	ft
Number of Lanes, N	3	
Total Ramp Density, TRD	0.50	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	75.4	mph

Calc Speed Adj and FFS

f_{LW}	0.0	mph
f_{LC}	0.0	mph
TRD Adjustment	1.8	mph
FFS	73.6	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	960	pc/h/ln
S	75.0	mph
D = v_p / S	12.8	pc/mi/ln
LOS	B	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
DDHV - Directional design hour volume
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

BASIC FREEWAY SEGMENTS WORKSHEET

General Information

Analyst	*HG*
Agency or Company	*CIMA*
Date Performed	*23/07/2013*
Analysis Time Period	*PM Peak*

Site Information

Highway/Direction of Travel	*RHVP 5SB Mainline*
From/To	*Dartnall Interchange*
Jurisdiction	
Analysis Year	*2013*

Project Description *Redhill Safety Study*

ɵ Oper.(LOS) 0 Des.(N) 0 Planning Data

Flow Inputs

Volume, V	*4015*	veh/h	Peak-Hour Factor, PHF	*0.95*
AADT		veh/day	%Trucks and Buses, P_T	*5*
Peak-Hr Prop. of AADT, K			%RVs, P_R	*0*
Peak-Hr Direction Prop, D			General Terrain:	*Level*
DDHV = AADT x K x D		veh/h	Grade % Length	mi
			Up/Down %	

Calculate Flow Adjustments

f_p	*1.00*	E_R	*1.2*
E_T	*1.5*	$f_{HV} = 1/[1+P_T(E_T-1)+P_R(E_R-1)]$	*0.976*

Speed Inputs

Lane Width	*12.0*	ft
Rt-Side Lat. Clearance	*6.0*	ft
Number of Lanes, N	*3*	
Total Ramp Density, TRD	*0.50*	ramps/mi
FFS (measured)		mph
Base free-flow Speed, BFFS	*75.4*	mph

Calc Speed Adj and FFS

f_{LW}	*0.0*	mph
f_{LC}	*0.0*	mph
TRD Adjustment	*1.8*	mph
FFS	*73.6*	mph

LOS and Performance Measures

Operational (LOS)

v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)	*1444*	pc/h/ln
S	*72.8*	mph
D = v_p / S	*19.8*	pc/mi/ln
LOS	*C*	

Design (N)

Design (N)

Design LOS		
v_p = (V or DDHV) / (PHF x N x f_{HV} x f_p)		pc/h/ln
S		mph
D = v_p / S		pc/mi/ln
Required Number of Lanes, N		

Glossary

N - Number of lanes
V - Hourly volume
v_p - Flow rate
LOS - Level of service
S - Speed
D - Density
FFS - Free-flow speed
BFFS - Base free-flow speed
DDHV - Directional design hour volume

Factor Location

E_R - Exhibits 11-10, 11-12
E_T - Exhibits 11-10, 11-11, 11-13
f_p - Page 11-18
LOS, S, FFS, v_p - Exhibits 11-2, 11-3
f_{LW} - Exhibit 11-8
f_{LC} - Exhibit 11-9
TRD - Page 11-11

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	HG	Freeway/Dir of Travel	RHVP 1EB-Entering Ramp
Agency or Company	CIMA	Junction	1EB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp: o Yes o On / ϴ No o Off

L_{up} = ft

V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	500
Deceleration Lane Length L_D	
Freeway Volume, V_F	2880
Ramp Volume, V_R	440
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	35.0

Downstream Adj Ramp: o Yes o On / ϴ No o Off

L_{down} = ft

V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2880	0.94	Level	0	0	1.000	1.00	3064
Ramp	440	0.94	Level	0	0	1.000	1.00	468
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3064 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes ϴ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes ϴ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3532	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3532	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 29.7 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.419 (Exibit 13-11)

S_R= 58.3 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 58.3 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 1EB-Entering Ramp
Agency or Company	CIMA	Junction	1EB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	PM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
o Yes o On	Freeway Number of Lanes, N	2	o Yes o On
o No o Off	Ramp Number of Lanes, N	1	o No o Off
L_{up} = ft	Acceleration Lane Length, L_A	500	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D		V_D = veh/h
	Freeway Volume, V_F	2864	
	Ramp Volume, V_R	529	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2864	0.94	Level	0	0	1.000	1.00	3047
Ramp	529	0.94	Level	0	0	1.000	1.00	563
UpStream								
DownStream								

Merge Areas	Diverge Areas

Estimation of v_{12}

Merge Areas

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3047 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Diverge Areas

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3610	Exhibit 13-8		No

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3610	Exhibit 13-8	4600:All	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\,v_R + 0.0078\,V_{12} - 0.00627\,L_A$

D_R = 30.2 (pc/mi/ln)

LOS = D (Exhibit 13-2)

$D_R = 4.252 + 0.0086\,V_{12} - 0.009\,L_D$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = 0.430 (Exibit 13-11)

S_R= 58.0 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 58.0 mph (Exhibit 13-13)

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 1EB Exiting Ramp
Agency or Company	CIMA	Junction	1EB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp	Freeway/Ramp Inputs		Downstream Adj Ramp
○ Yes ○ On	Freeway Number of Lanes, N	2	○ Yes ○ On
● No ○ Off	Ramp Number of Lanes, N	1	● No ○ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	500	V_D = veh/h
	Freeway Volume, V_F	2880	
	Ramp Volume, V_R	454	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2880	0.94	Level	0	0	1.000	1.00	3064
Ramp	454	0.94	Level	0	0	1.000	1.00	483
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ○ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ○ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 3064 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ● No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ● No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3064	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2581	Exhibit 13-8	4800	No
V_R	483	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3064	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 26.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.471 (Exhibit 13-12)

S_R= 56.8 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 56.8 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	HG	Freeway/Dir of Travel	RHVP 1EB Exiting Ramp
Agency or Company	CIMA	Junction	1EB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	PM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
Yes / On	Freeway Number of Lanes, N	2	Yes / On
No / Off	Ramp Number of Lanes, N	1	No / Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	500	V_D = veh/h
	Freeway Volume, V_F	2864	
	Ramp Volume, V_R	498	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2864	0.94	Level	0	0	1.000	1.00	3047
Ramp	498	0.94	Level	0	0	1.000	1.00	530
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} =	(Equation 13-6 or 13-7)
P_{FM} =	using Equation (Exhibit 13-6)
V_{12} =	pc/h
V_3 or V_{av34}	pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h?	Yes / No
Is V_3 or V_{av34} > 1.5 * V_{12}/2	Yes / No
If Yes, V_{12a} =	pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} =	(Equation 13-12 or 13-13)
P_{FD} =	1.000 using Equation (Exhibit 13-7)
V_{12} =	3047 pc/h
V_3 or V_{av34}	0 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h?	Yes / No
Is V_3 or V_{av34} > 1.5 * V_{12}/2	Yes / No
If Yes, V_{12a} =	pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3047	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2517	Exhibit 13-8	4800	No
V_R	530	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	3047	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 26.0 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.476 (Exhibit 13-12)

S_R= 56.7 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 56.7 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 1WB-Entering Ramp
Agency or Company	CIMA	Junction	1WB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
o Yes o On	Freeway Number of Lanes, N: 2	o Yes o On
⊖ No o Off	Ramp Number of Lanes, N: 1	⊖ No o Off
L_{up} = ft	Acceleration Lane Length, L_A: 500	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2866	
	Ramp Volume, V_R: 435	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 30.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2866	0.94	Level	0	0	1.000	1.00	3049
Ramp	435	0.94	Level	0	0	1.000	1.00	463
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3049 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes ⊖ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes ⊖ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3512	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3512	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 29.5 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.422 (Exibit 13-11)

S_R= 58.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 58.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 1WB-Entering Ramp
Agency or Company	CIMA	Junction	1WB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	PM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
o Yes o On	Freeway Number of Lanes, N: 2	
⊖ No o Off	Ramp Number of Lanes, N: 1	o Yes o On
	Acceleration Lane Length, L_A: 500	⊖ No o Off
	Deceleration Lane Length L_D:	
L_{up} = ft	Freeway Volume, V_F: 3100	L_{down} = ft
	Ramp Volume, V_R: 441	
V_u = veh/h	Freeway Free-Flow Speed, S_{FF}: 70.0	V_D = veh/h
	Ramp Free-Flow Speed, S_{FR}: 30.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3100	0.94	Level	0	0	1.000	1.00	3298
Ramp	441	0.94	Level	0	0	1.000	1.00	469
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3298 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes ⊖ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes ⊖ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3767	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3767	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 31.5 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.460 (Exhibit 13-11)

S_R= 57.1 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 57.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst	HG	Freeway/Dir of Travel	RHVP 2EB Exiting Ramp
Agency or Company	CIMA	Junction	2EB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
o Yes o On	Freeway Number of Lanes, N: 2	o Yes o On
o No o Off	Ramp Number of Lanes, N: 2	o No o Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D: 500	V_D = veh/h
	Freeway Volume, V_F: 2766	
	Ramp Volume, V_R: 588	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2766	0.94	Level	0	0	1.000	1.00	2943
Ramp	588	0.94	Level	0	0	1.000	1.00	626
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 2943 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes,V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2943	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2317	Exhibit 13-8	4800	No
V_R	626	Exhibit 13-10	4000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2943	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = 16.1 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.484 (Exhibit 13-12)

S_R= 56.4 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 56.4 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 2EB Exiting Ramp
Agency or Company	CIMA	Junction	2EB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	PM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
○ Yes ○ On	Freeway Number of Lanes, N	2	○ Yes ○ On
● No ○ Off	Ramp Number of Lanes, N	2	● No ○ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	500	V_D = veh/h
	Freeway Volume, V_F	2214	
	Ramp Volume, V_R	1108	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2214	0.94	Level	0	0	1.000	1.00	2355
Ramp	1108	0.94	Level	0	0	1.000	1.00	1179
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ○ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ○ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 2355 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ● No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ● No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2355	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	1176	Exhibit 13-8	4800	No
V_R	1179	Exhibit 13-10	4000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2355	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 11.0 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.534 (Exhibit 13-12)

S_R= 55.0 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 55.0 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information

Analyst	HG	Freeway/Dir of Travel	RHVP 2WB Exiting Ramp
Agency or Company	CIMA	Junction	2WB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
o Yes o On	Freeway Number of Lanes, N: 3	o Yes o On
⊖ No o Off	Ramp Number of Lanes, N: 1	⊖ No o Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D: 500	V_D = veh/h
	Freeway Volume, V_F: 3075	
	Ramp Volume, V_R: 462	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3075	0.94	Level	0	0	1.000	1.00	3271
Ramp	462	0.94	Level	0	0	1.000	1.00	491
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.656 using Equation (Exhibit 13-7)

V_{12} = 2314 pc/h

V_3 or V_{av34} 957 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes ⊖ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes ⊖ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3271	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	2780	Exhibit 13-8	7200	No
V_R	491	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2314	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$$

D_R = 19.7 (pc/mi/ln)

LOS = B (Exhibit 13-2)

Speed Determination

D_s = 0.472 (Exhibit 13-12)

S_R= 56.8 mph (Exhibit 13-12)

S_0= 76.8 mph (Exhibit 13-12)

S = 61.5 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		**Site Information**	
Analyst	HG	Freeway/Dir of Travel	RHVP 2WB Exiting Ramp
Agency or Company	CIMA	Junction	2WB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	PM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
○ Yes ○ On	Freeway Number of Lanes, N: 3	○ Yes ○ On
● No ○ Off	Ramp Number of Lanes, N: 1	● No ○ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D: 500	V_D = veh/h
	Freeway Volume, V_F: 3376	
	Ramp Volume, V_R: 543	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3376	0.94	Level	0	0	1.000	1.00	3591
Ramp	543	0.94	Level	0	0	1.000	1.00	578
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$V_{12} = V_F\,(P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ○ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ○ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.644 using Equation (Exhibit 13-7)

V_{12} = 2517 pc/h

V_3 or V_{av34} 1074 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ● No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ● No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	3591	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	3013	Exhibit 13-8	7200	No
V_R	578	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2517	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 21.4 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.480 (Exhibit 13-12)

S_R= 56.6 mph (Exhibit 13-12)

S_0= 76.5 mph (Exhibit 13-12)

S = 61.3 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 3WB-Entering Ramp
Agency or Company	CIMA	Junction	3WB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
Yes / On	Freeway Number of Lanes, N: 3	Yes / On
No / Off	Ramp Number of Lanes, N: 1	No / Off
L_{up} = ft	Acceleration Lane Length, L_A: 500	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 2194	
	Ramp Volume, V_R: 1273	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 30.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2194	0.94	Level	0	0	1.000	1.00	2334
Ramp	1273	0.94	Level	0	0	1.000	1.00	1354
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 0.591 using Equation (Exhibit 13-6)

V_{12} = 1381 pc/h

V_3 or V_{av34} 953 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? Yes No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 Yes No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3688	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2735	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 23.1 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.351 (Exibit 13-11)

S_R= 60.2 mph (Exhibit 13-11)

S_0= 68.4 mph (Exhibit 13-11)

S = 62.1 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? Yes No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 Yes No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 3WB-Entering Ramp
Agency or Company	CIMA	Junction	3WB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	PM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
○ Yes ○ On	Freeway Number of Lanes, N	3	○ Yes ○ On
◉ No ○ Off	Ramp Number of Lanes, N	1	◉ No ○ Off
L_{up} = ft	Acceleration Lane Length, L_A	500	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D		V_D = veh/h
	Freeway Volume, V_F	2770	
	Ramp Volume, V_R	834	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	30.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2770	0.94	Level	0	0	1.000	1.00	2947
Ramp	834	0.94	Level	0	0	1.000	1.00	887
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F\,(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)
P_{FM} = 0.591 using Equation (Exhibit 13-6)
V_{12} = 1743 pc/h
V_3 or V_{av34} 1204 pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ◉ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ◉ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3834	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	2630	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 22.4 (pc/mi/ln)
LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.345 (Exibit 13-11)
S_R= 60.3 mph (Exhibit 13-11)
S_0= 67.5 mph (Exhibit 13-11)
S = 62.4 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)
P_{FD} = using Equation (Exhibit 13-7)
V_{12} = pc/h
V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)
Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ○ No
Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ○ No
If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)
LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)
S_R= mph (Exhibit 13-12)
S_0= mph (Exhibit 13-12)
S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 4NB-Entering Ramp
Agency or Company	CIMA	Junction	4NB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
o Yes o On	Freeway Number of Lanes, N	2	o Yes o On
⊖ No o Off	Ramp Number of Lanes, N	1	⊖ No o Off
L_{up} = ft	Acceleration Lane Length, L_A	500	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D		V_D = veh/h
	Freeway Volume, V_F	3846	
	Ramp Volume, V_R	1092	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	30.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3846	0.94	Level	0	0	1.000	1.00	4091
Ramp	1092	0.94	Level	0	0	1.000	1.00	1162
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F(P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4091 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes ⊖ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes ⊖ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	5253	Exhibit 13-8		Yes

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	5253	Exhibit 13-8	4600:All	Yes

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 42.8 (pc/mi/ln)

LOS = F (Exhibit 13-2)

Speed Determination

M_S = 1.036 (Exibit 13-11)

S_R= 41.0 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 41.0 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 4NB-Entering Ramp
Agency or Company	CIMA	Junction	4NB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
o Yes o On	Freeway Number of Lanes, N: 2	o Yes o On
⊖ No o Off	Ramp Number of Lanes, N: 1	⊖ No o Off
L_{up} = ft	Acceleration Lane Length, L_A: 500	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 3007	
	Ramp Volume, V_R: 937	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 30.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3007	0.94	Level	0	0	1.000	1.00	3199
Ramp	937	0.94	Level	0	0	1.000	1.00	997
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 3199 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes ⊖ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes ⊖ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	4196	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4196	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 34.6 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

M_S = 0.550 (Exhibit 13-11)

S_R= 54.6 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 54.6 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst		Freeway/Dir of Travel	RHVP 4SB Exiting Ramp
Agency or Company	CIMA	Junction	4SB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
○ Yes ○ On	Freeway Number of Lanes, N: 3	○ Yes ○ On
● No ○ Off	Ramp Number of Lanes, N: 2	● No ○ Off
L_{up} = ft	Acceleration Lane Length, L_A:	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D: 500	V_D = veh/h
	Freeway Volume, V_F: 2194	
	Ramp Volume, V_R: 559	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2194	0.94	Level	0	0	1.000	1.00	2334
Ramp	559	0.94	Level	0	0	1.000	1.00	595
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ○ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ○ Yes ○ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 1378 pc/h

V_3 or V_{av34} 956 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ● No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ ○ Yes ● No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2334	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	1739	Exhibit 13-8	7200	No
V_R	595	Exhibit 13-10	4000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	1378	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 2.6 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination

D_s = 0.482 (Exhibit 13-12)

S_R= 56.5 mph (Exhibit 13-12)

S_0= 76.8 mph (Exhibit 13-12)

S = 63.4 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 4SB Exiting Ramp
Agency or Company	CIMA	Junction	4SB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	PM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
○ Yes ○ On ◉ No ○ Off L_{up} = ft V_u = veh/h	Freeway Number of Lanes, N: 3 Ramp Number of Lanes, N: 2 Acceleration Lane Length, L_A: Deceleration Lane Length L_D: 500 Freeway Volume, V_F: 2770 Ramp Volume, V_R: 1289 Freeway Free-Flow Speed, S_{FF}: 70.0 Ramp Free-Flow Speed, S_{FR}: 35.0	○ Yes ○ On ◉ No ○ Off L_{down} = ft V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2770	0.94	Level	0	0	1.000	1.00	2947
Ramp	1289	0.94	Level	0	0	1.000	1.00	1371
UpStream								
DownStream								

Merge Areas	Diverge Areas

Estimation of v_{12} (Merge Areas)

$V_{12} = V_F (P_{FM})$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ○ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ○ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} (Diverge Areas)

$V_{12} = V_R + (V_F - V_R)P_{FD}$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 0.450 using Equation (Exhibit 13-7)

V_{12} = 2080 pc/h

V_3 or V_{av34} 867 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ◉ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ◉ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks (Merge)

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Capacity Checks (Diverge)

	Actual	Capacity		LOS F?
V_F	2947	Exhibit 13-8	7200	No
$V_{FO} = V_F - V_R$	1576	Exhibit 13-8	7200	No
V_R	1371	Exhibit 13-10	4000	No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2080	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F) (Merge)

$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Level of Service Determination (if not F) (Diverge)

$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$

D_R = 8.6 (pc/mi/ln)

LOS = A (Exhibit 13-2)

Speed Determination (Merge)

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Speed Determination (Diverge)

D_s = 0.551 (Exhibit 13-12)

S_R= 54.6 mph (Exhibit 13-12)

S_0= 76.8 mph (Exhibit 13-12)

S = 59.6 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 6NB Exiting Ramp
Agency or Company	CIMA	Junction	6NB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
○ Yes ○ On	Freeway Number of Lanes, N	2	○ Yes ○ On
● No ○ Off	Ramp Number of Lanes, N	1	● No ○ Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	500	V_D = veh/h
	Freeway Volume, V_F	3798	
	Ramp Volume, V_R	301	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	3798	0.94	Level	0	0	1.000	1.00	4040
Ramp	301	0.94	Level	0	0	1.000	1.00	320
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ○ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ○ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$D_R = 5.475 + 0.00734\ v_R + 0.0078\ V_{12} - 0.00627\ L_A$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 4040 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? ○ Yes ● No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 ○ Yes ● No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	4040	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	3720	Exhibit 13-8	4800	No
V_R	320	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	4040	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$D_R = 4.252 + 0.0086\ V_{12} - 0.009\ L_D$

D_R = 34.5 (pc/mi/ln)

LOS = D (Exhibit 13-2)

Speed Determination

D_s = 0.457 (Exhibit 13-12)

S_R= 57.2 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.2 mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information / Site Information

Analyst	HG	Freeway/Dir of Travel	RHVP 6NB Exiting Ramp
Agency or Company	CIMA	Junction	6NB Exiting Ramp
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	PM Peak Hour	Analysis Year	2013

Project Description REdhill Safety Study

Inputs

Upstream Adj Ramp			Downstream Adj Ramp
o Yes o On	Freeway Number of Lanes, N	2	o Yes o On
θ No o Off	Ramp Number of Lanes, N	1	θ No o Off
L_{up} = ft	Acceleration Lane Length, L_A		L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D	500	V_D = veh/h
	Freeway Volume, V_F	2779	
	Ramp Volume, V_R	363	
	Freeway Free-Flow Speed, S_{FF}	70.0	
	Ramp Free-Flow Speed, S_{FR}	35.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2779	0.94	Level	0	0	1.000	1.00	2956
Ramp	363	0.94	Level	0	0	1.000	1.00	386
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = using Equation (Exhibit 13-6)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}		Exhibit 13-8		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

M_S = (Exibit 13-11)

S_R= mph (Exhibit 13-11)

S_0= mph (Exhibit 13-11)

S = mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = 1.000 using Equation (Exhibit 13-7)

V_{12} = 2956 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes θ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes θ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F	2956	Exhibit 13-8	4800	No
$V_{FO} = V_F - V_R$	2570	Exhibit 13-8	4800	No
V_R	386	Exhibit 13-10	2000	No

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}	2956	Exhibit 13-8	4400:All	No

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = 25.2 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

D_s = 0.463 (Exhibit 13-12)

S_R= 57.0 mph (Exhibit 13-12)

S_0= N/A mph (Exhibit 13-12)

S = 57.0 mph (Exhibit 13-13)

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RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 6SB-Entering Ramp
Agency or Company	CIMA	Junction	6SB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	AM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp: o Yes o On; ⊖ No o Off; L_{up} = ft; V_u = veh/h

Freeway Number of Lanes, N	2
Ramp Number of Lanes, N	1
Acceleration Lane Length, L_A	500
Deceleration Lane Length L_D	
Freeway Volume, V_F	2669
Ramp Volume, V_R	321
Freeway Free-Flow Speed, S_{FF}	70.0
Ramp Free-Flow Speed, S_{FR}	30.0

Downstream Adj Ramp: o Yes o On; ⊖ No o Off; L_{down} = ft; V_D = veh/h

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	2669	0.94	Level	0	0	1.000	1.00	2839
Ramp	321	0.94	Level	0	0	1.000	1.00	341
UpStream								
DownStream								

Merge Areas

Estimation of v_{12}

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 2839 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes ⊖ No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ o Yes ⊖ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_{FO}	3180	Exhibit 13-8		No

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	3180	Exhibit 13-8	4600:All	No

Level of Service Determination (if not F)

$$D_R = 5.475 + 0.00734\, v_R + 0.0078\, V_{12} - 0.00627\, L_A$$

D_R = 27.0 (pc/mi/ln)

LOS = C (Exhibit 13-2)

Speed Determination

M_S = 0.385 (Exhibit 13-11)

S_R= 59.2 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 59.2 mph (Exhibit 13-13)

Diverge Areas

Estimation of v_{12}

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * $V_{12}/2$ o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F)

$$D_R = 4.252 + 0.0086\, V_{12} - 0.009\, L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

RAMPS AND RAMP JUNCTIONS WORKSHEET

General Information		Site Information	
Analyst	HG	Freeway/Dir of Travel	RHVP 6SB-Entering Ramp
Agency or Company	CIMA	Junction	6SB Entering
Date Performed	23/07/2013	Jurisdiction	Hamilton
Analysis Time Period	PM Peak Hour	Analysis Year	2013

Project Description Redhill Safety Study

Inputs

Upstream Adj Ramp		Downstream Adj Ramp
o Yes o On	Freeway Number of Lanes, N: 2	o Yes o On
θ No o Off	Ramp Number of Lanes, N: 1	θ No o Off
L_{up} = ft	Acceleration Lane Length, L_A: 500	L_{down} = ft
V_u = veh/h	Deceleration Lane Length L_D:	V_D = veh/h
	Freeway Volume, V_F: 4015	
	Ramp Volume, V_R: 316	
	Freeway Free-Flow Speed, S_{FF}: 70.0	
	Ramp Free-Flow Speed, S_{FR}: 30.0	

Conversion to pc/h Under Base Conditions

(pc/h)	V (Veh/hr)	PHF	Terrain	%Truck	%Rv	f_{HV}	f_p	$v = V/PHF \times f_{HV} \times f_p$
Freeway	4015	0.94	Level	0	0	1.000	1.00	4271
Ramp	316	0.94	Level	0	0	1.000	1.00	336
UpStream								
DownStream								

Merge Areas	Diverge Areas

Estimation of v_{12} (Merge Areas)

$$V_{12} = V_F (P_{FM})$$

L_{EQ} = (Equation 13-6 or 13-7)

P_{FM} = 1.000 using Equation (Exhibit 13-6)

V_{12} = 4271 pc/h

V_3 or V_{av34} 0 pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes θ No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes θ No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Estimation of v_{12} (Diverge Areas)

$$V_{12} = V_R + (V_F - V_R)P_{FD}$$

L_{EQ} = (Equation 13-12 or 13-13)

P_{FD} = using Equation (Exhibit 13-7)

V_{12} = pc/h

V_3 or V_{av34} pc/h (Equation 13-14 or 13-17)

Is V_3 or V_{av34} > 2,700 pc/h? o Yes o No

Is V_3 or V_{av34} > 1.5 * V_{12}/2 o Yes o No

If Yes, V_{12a} = pc/h (Equation 13-16, 13-18, or 13-19)

Capacity Checks (Merge)

	Actual	Capacity		LOS F?
V_{FO}	4607	Exhibit 13-8		No

Capacity Checks (Diverge)

	Actual	Capacity		LOS F?
V_F		Exhibit 13-8		
$V_{FO} = V_F - V_R$		Exhibit 13-8		
V_R		Exhibit 13-10		

Flow Entering Merge Influence Area

	Actual	Max Desirable		Violation?
V_{R12}	4607	Exhibit 13-8	4600:All	Yes

Flow Entering Diverge Influence Area

	Actual	Max Desirable		Violation?
V_{12}		Exhibit 13-8		

Level of Service Determination (if not F) (Merge)

$$D_R = 5.475 + 0.00734 v_R + 0.0078 V_{12} - 0.00627 L_A$$

D_R = 38.1 (pc/mi/ln)

LOS = E (Exhibit 13-2)

Level of Service Determination (if not F) (Diverge)

$$D_R = 4.252 + 0.0086 V_{12} - 0.009 L_D$$

D_R = (pc/mi/ln)

LOS = (Exhibit 13-2)

Speed Determination (Merge)

M_S = 0.682 (Exibit 13-11)

S_R= 50.9 mph (Exhibit 13-11)

S_0= N/A mph (Exhibit 13-11)

S = 50.9 mph (Exhibit 13-13)

Speed Determination (Diverge)

D_s = (Exhibit 13-12)

S_R= mph (Exhibit 13-12)

S_0= mph (Exhibit 13-12)

S = mph (Exhibit 13-13)

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APPENDIX C

I MINA I N A AN S

Road Name
From Red Hill Valley Parkway (Dartnall Intch.)
City Pritchard 1 km west of Dartnall
Warrant Undertaken by
Company name Hamilton, ON
Date AN+GB
CIMA+
June 19, 2013

Warrants for Lighting Interchanges (See Note 2)

Item No.	Classification Factor	Rating Factor 'R' 1	2	3	4	5	Weight 'W'	Enter 'R' Here	Score 'R' x 'W'	
	Geometric Factors (See Note 4)									
1	Number of Freeway Lanes	≤4	5	6	7	≥ 8	0.10			
2	Freeway Lane Widths (m)	>3.6	3.4 to 3.6	3.2 to 3.4	3.0 to 3.2	<3.0	0.35		0.20	
3	Freeway Median Width (m)	>12	10.4 to 12.0	3.6 to 10.4	1.2 to 3.6	<1.2	0.35	2 1	0.35	
4	Ramp Types	Direct	Diamond	Parclos and Cloverleafs	Trumpet	Scissors and Left-Side	0.65	1	0.35	
5	Main Lane Curve Radius (m)	>3500	1750 to 3500	875 to 1750	575 to 875	<575	5.35	4	2.60	
6	Vertical Grades (%)	< 3	3.0 to 3.9	4.0 to 4.9	5.0 to 6.9	>7	0.25	4	21.40	
7	Cross Road Channelization	None	—	Continuous	—	At Interchange Intersections	0.65	1	0.25	
8	Frontage Roads	None	—	One-Way	—	Two Way	0.35	3	1.95	
9	Sight Distance to Cross Road Intersections (m)	>300	215 to 300	150 to 215	120 to 150	<120	0.10	1	0.35	
						Subtotal Geometric Factors		2	0.20	G
									27.65	
	Operational Factors									
10	Level of Service (Night at any Hour)	A	B	C	D	≥E	3.35			
						Subtotal Operational Factors			10.05	O
									10.05	
	Environmental Factors									
11	Percentage of Development Adjacent to Road (%)	nil	1 Quad	2 Quad	3 Quad	4 Quad	1.00			
12	Distance from Development to Roadway (m) (See Note 3)	>60	45 to 60	30 to 45	15 to 30	<15	0.15	3	3.00	
13	Cross Road Lighting	None	—	Partial	—	Continuous or Warranted	0.70	1	0.15	
14	Freeway Lighting	None	—	Interchanges Only	—	Continuous (See Note 1) or Warranted	1.30	3	2.10	
						Subtotal Environmental Factors		3	3.90	E
									9.15	
	Collision Factors									
15	Night-to-Day Collision Ratio	<1.0	1.0 to 1.2	1.2 to 1.5	1.5 to 2.0	>2.0 (See Note 1)	5.35			
						Subtotal Collision Factors			10.70	A
									10.70	
						G + O + E + A = Total Warranting Points			60.00	
						Warranting Condition			57.55	
						Difference ±				D
									-2.45	

Notes:
1 Full Interchange Lighting Warranted
2 Operating Speed 80 km/hr (95th percentile night speed should be used if available, other wise posted speed shall be used
3 Development Meaning Commercial, Industrial, Residential Buildings
4 Worst Case Geometric Factors for a Segment of Roadway Shall Apply

v1.0

* If Level of Service reaches D at any hour during night time, illumination is warranted (Total Warranting Points = 60.90)

Figure 9-12 – Warrant for Lighting Interchanges

HAM0064439_0001
RHV0001045

Road Name
From ~~Red Hill Valley Parkway~~ (Greenhill Intch.)
City ~~1 km up. 1 km downstream~~
Warrant Undertaken by
Company name Hamilton, ON
Date AN+GB
CIMA+
June 19, 2013

Warrants for Lighting Interchanges (See Note 2)

Item No.	Classification Factor	Rating Factor 'R' 1	2	3	4	5	Weight 'W'	Enter 'R' Here	Score 'R' x 'W'
	Geometric Factors (See Note 4)								
1	Number of Freeway Lanes	≦4	5	6	7	≧8	0.10		
2	Freeway Lane Widths (m)	>3.6	3.4 to 3.6	3.2 to 3.4	3.0 to 3.2	<3.0	0.35		
3	Freeway Median Width (m)	>12	10.4 to 12.0	3.6 to 10.4	1.2 to 3.6	<1.2	0.35	2	0.20
4	Ramp Types	Direct	Diamond	Parclos and Cloverleafs	Trumpet	Scissors and Left-Side	0.65	1 3	0.35 1.05
5	Main Lane Curve Radius (m)	>3500	1750 to 3500	875 to 1750	575 to 875	<575	5.35	2	1.30
6	Vertical Grades (%)	< 3	3.0 to 3.9	4.0 to 4.9	5.0 to 6.9	>7	0.25		
7	Cross Road Channelization	None	—	Continuous	—	At Interchange Intersections	0.65	1 1 3	5.35 0.25
8	Frontage Roads	None	—	One-Way	—	Two Way	0.35		1.95
9	Sight Distance to Cross Road Intersections (m)	>300	215 to 300	150 to 215	120 to 150	<120	0.10	1	0.35
						Subtotal Geometric Factors		3	0.30 G 11.10
	Operational Factors								
10	Level of Service (Night at any Hour)	A	B	C	D	≧E	3.35		
						Subtotal Operational Factors		3	10.05 O 10.05
	Environmental Factors								
11	Percentage of Development Adjacent to Road (%)	nil	1 Quad	2 Quad	3 Quad	4 Quad	1.00		
12	Distance from Development to Roadway (m) (See Note 3)	>60	45 to 60	30 to 45	15 to 30	<15	0.15	3	3.00
13	Cross Road Lighting	None	—	Partial	—	Continuous or Warranted	0.70	3	0.45
14	Freeway Lighting	None	—	Interchanges Only	—	Continuous (See Note 1) or Warranted	1.30	5	3.50
						Subtotal Environmental Factors		3	3.90 E 10.85
	Collision Factors								
15	Night-to-Day Collision Ratio	<1.0	1.0 to 1.2	1.2 to 1.5	1.5 to 2.0	>2.0 (See Note 1)	5.35		
						Subtotal Collision Factors		1	5.35 A 5.35
						G + O + E + A = Total Warranting Points			
						Warranting Condition			60.00 37.35
						Difference ±			D -22.65

Notes:
1 Full Interchange Lighting Warranted
2 Operating Speed 80 km/hr (95th percentile night speed should be used if available, other wise posted speed shall be used
3 Development Meaning Commercial, Industrial, Residential Buildings
4 Worst Case Geometric Factors for a Segment of Roadway Shall Apply

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Figure 9-12 – Warrant for Lighting Interchanges

TAC ATC

Road Name______________
From ~~Red Hill Valley Par~~kway (Mud Street)
City ~~Pritchard 1km downs~~tream of Interchange
Warrant Undertaken by__________
Company name Hamilton, ON
Date AN+GB
CIMA+
June 19, 2013

Warrants for Lighting Interchanges (See Note 2)

Item No.	Classification Factor	Rating Factor 'R' 1	2	3	4	5	Weight 'W'	Enter 'R' Here	Score 'R' x 'W'
	Geometric Factors (See Note 4)								
1	Number of Freeway Lanes	≤4	5	6	7	≥ 8	0.10		
2	Freeway Lane Widths (m)	>3.6	3.4 to 3.6	3.2 to 3.4	3.0 to 3.2	<3.0	0.35		
3	Freeway Median Width (m)	>12	10.4 to 12.0	3.6 to 10.4	1.2 to 3.6	<1.2	0.35	2	0.20
4	Ramp Types	Direct	Diamond	Parclos and Cloverleafs	Trumpet	Scissors and Left-Side	0.65	1 1	0.35 0.35
5	Main Lane Curve Radius (m)	>3500	1750 to 3500	875 to 1750	575 to 875	<575	5.35	3	1.95
6	Vertical Grades (%)	< 3	3.0 to 3.9	4.0 to 4.9	5.0 to 6.9	>7	0.25		
7	Cross Road Channelization	None	—	Continuous	—	At Interchange Intersections	0.65	4 1	21.40 0.25
8	Frontage Roads	None	—	One-Way	—	Two Way	0.35	3	1.95
9	Sight Distance to Cross Road Intersections (m)	>300	215 to 300	150 to 215	120 to 150	<120	0.10	1	0.35
						Subtotal Geometric Factors		3	0.30 G
									27.10
	Operational Factors								
10	Level of Service (Night at any Hour)	A	B	C	D	≧E	3.35		
						Subtotal Operational Factors			10.05 O
	Environmental Factors								10.05
11	Percentage of Development Adjacent to Road (%)	nil	1 Quad	2 Quad	3 Quad	4 Quad	1.00		
12	Distance from Development to Roadway (m) (See Note 3)	>60	45 to 60	30 to 45	15 to 30	<15	0.15	3	3.00
13	Cross Road Lighting	None	—	Partial	—	Continuous or Warranted	0.70	1	0.15
14	Freeway Lighting	None	—	Interchanges Only	—	Continuous (See Note 1) or Warranted	1.30	3	2.10
						Subtotal Environmental Factors		3	3.90 E
									9.15
	Collision Factors								
15	Night-to-Day Collision Ratio	<1.0	1.0 to 1.2	1.2 to 1.5	1.5 to 2.0	>2.0 (See Note 1)	5.35		
						Subtotal Collision Factors			10.70 A
									16.05
						G + O + E + A = Total Warranting Points			
						Warranting Condition			60.00
						Difference ±			D
									2.35

Notes:
1 Full Interchange Lighting Warranted
2 Operating Speed 80 km/hr (95th percentile night speed should be used if available, other wise posted speed shall be used
3 Development Meaning Commercial, Industrial, Residential Buildings
4 Worst Case Geometric Factors for a Segment of Roadway Shall Apply

v1.0

Figure 9-12 – Warrant for Lighting Interchanges

APPENDIX D

enefit Cost Analysis In uts esults

Benefit-Cost Ratio Results

Countermeasures	Road Element	Benefit	Targeted Collisions	Benefit (Number of Collisions) Fatal	Non-Fatal	PDO	Benefit (Monetary Value, 5-year)	Service Life	Total Benefit ($)	Cost ($)	B/C Ratio
Entire Study Area											
PRPM		10.2	All Collisions	0.05	3.49	6.61	$245,593	5	$245,592.84	$74,700	3.29
Wider Marking		2.6	Fatal + Injury	0.04	2.60		$135,537	5	$135,536.79	$40,000	3.39
Illumination (Freeway)		33.8	Night Time	0.18	11.65	22.02	$818,643	20	$3,274,571.23	$800,000	4.09
Illumination (Ramps)		14.7	Night Time	0.08	5.04	9.54	$354,513	20	$1,418,052.50	$2,750,000	0.52
High Friction Pavement (Ramp 6)		8.9	All Collisions	0.05	3.06	5.79	$215,212	5	$215,212.20	$ 92,863	2.32
Illumination (Ramp 6)											
Single Road Element											
High Friction Pavement	Ramp #3	1.8	All Collisions	0.01	0.63	1.18	$44,007	5	$44,006.51		
	Ramp #5	0.6	All Collisions	0.00	0.21	0.40	$14,966	5	$14,965.56		
	Ramp #7a	**1.2**	**All Collisions**	**0.01**	**0.42**	**0.80**	**$29,661**	**5**	**$29,660.57**	**$ 86,250**	**0.34**
	Ramps #7b	**0.9**	**All Collisions**	**0.00**	**0.31**	**0.58**	**$21,575**	**5**	**$21,574.95**	**$ 57,500**	**0.38**
	Ramp #6	**8.9**	**All Collisions**	**0.05**	**3.06**	**5.79**	**$215,212**	**5**	**$215,212.20**	**$ 92,863**	**2.32**
	Ramp #8	1.4	All Collisions	0.01	0.50	0.94	$35,049	5	$35,049.45		
	Ramp #9	0.4	All Collisions	0.00	0.15	0.29	$10,617	5	$10,616.82		
	Ramp #10	0.2	All Collisions	0.00	0.08	0.15	$5,711	5	$5,710.75		
Illumination	Ramp #3	0.0	Night Time	0.00	0.00	0.00	$0	20	$0.00		
	Ramp #5	**0.2**	**Night Time**	**0.00**	**0.07**	**0.13**	**$4,989**	**20**	**$19,954.08**	**$ 275,000**	**0.07**
	Ramp #7a	**0.7**	**Night Time**	**0.00**	**0.23**	**0.44**	**$16,478**	**20**	**$65,912.38**	**$ 275,000**	**0.24**
	Ramps #7b	**0.4**	**Night Time**	**0.00**	**0.15**	**0.28**	**$10,274**	**20**	**$41,095.15**	**$ 275,000**	**0.15**
	Ramp #6	**10.8**	**Night Time**	**0.06**	**3.70**	**6.99**	**$260,048**	**20**	**$1,040,192.29**	**$ 275,000**	**3.78**
	Ramp #8	**2.4**	**Night Time**	**0.01**	**0.83**	**1.57**	**$58,416**	**20**	**$233,662.98**	**$ 275,000**	**0.85**
	Ramp #9	0.2	Night Time	0.00	0.06	0.12	$4,424	20	$17,694.69		
	Ramp #10	0.0	Night Time	0.00	0.00	0.00	$0	20	$0.00		

Inputs

Collision Proportions

Description	Fatal injury	Non fatal injury	PD only	Total
# of Collisions	1	64	121	186
Proportion (All)	1%	34%	65%	100%
Proportion (FI)	2%	98%		100%

Collisions Cost

	C-Fatal	C-Injury	C-PDO
Societal Costs (1990)	$831,429	$20,084	$6,136
Societal Costs (2013)	$1,308,127	$31,599	$9,654
EPDO	135.5	3.3	1.0

http://www.bankofcanada.ca/en/rates/inflation_calc.html

Average annual inflation rate:	1.99%	for 1990-2013
Number of years	23	
Compounded interest:	FV = PV*(1+i)^n	
Present Value	1	
Future Value	1.573347343	

Countermeasure Cost

Countermeasures	Unit Cost		Sq.m	Cost
PRPM	$ 30,000.00	mile (both directions)	2.5	$ 74,700
Wider Marking	$ 5.00	per metre	8000	$ 40,000.00
Illumination (Freeway)	$ 100,000.00	per kilometre	8.0	$ 800,000.00
Illumination (Ramp)	$ 275,000.00	per ramp	10	$ 2,750,000.00
High Friction Pavement (Ramp 6)	$ 50.00	sq m	1857.25	$ 92,862.50
High Friction Pavement (Ramp 7a)	$ 50.00	sq m	1725	$ 86,250.00
High Friction Pavement (Ramp 7b)	$ 50.00	sq m	1150	$ 57,500.00

7-Day Forecast for the City of Hamilton

Amec Foster Wheeler Forecast for Hamilton - North Zone

Hamilton

amec foster wheeler

Issued At: Saturday 24 October 2015 0600 EDT
Valid Until: Friday 30 October 2015 0800 EDT

Warning: NONE

Cloudy with showers developing this morning, becoming periods of rain with a risk of thunderstorms in the evening as cold front sweeps across the region. Showers end early Sunday morning followed by clearing skies through the day, as weak high pressure builds in.

Forecast

Date	Sat October 24 2015							Sun October 25 2015								Mon 26	
Period		Morning		Afternoon		Evening		Overnight		Morning		Afternoon		Evening		Overnight	
Hour Ending (EDT)	3 4 5	6 7 8	9 10 11	12 13 14	15 16 17	18 19 20	21 22 23	0 1 2	3 4 5	6 7 8	9 10 11	12 13 14	15 16 17	18 19 20	21 22 23	0 1 2	3 4 5
Rain / Showers																	
Liquid Rate (mm/3h)	0	0	1	< 1	< 1	3	4	< 1	< 1	0	0	0	0	0	0	0	0
Freez. Rate (mm/3h)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snow Rate (cm/3h)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liquid Accum. (mm)	0	0	1	1	2	4	8	9	9	9	9	9	9	9	9	9	9
Freez. Accum. (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snow Accum. (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Time (EDT)	05	08	11	14	17	20	23	02	05	08	11	14	17	20	23	02	05
Temperature (C)	6	7	12	15	15	15	14	11	8	7	10	12	10	5	3	3	3
Dew Point Temp (C)	3	4	6	12	14	14	13	10	6	5	5	4	2	1	2	1	1
Humidity (%)	83	76	68	82	94	94	94	93	87	87	71	58	57	75	93	87	87
Wind Chill	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	2	2
Cloud Cover (%)	90	90	100	100	100	100	100	100	100	80	0	0	0	0	0	0	0
Visibility (km)	15	15	15	15	5	5	5	6	11	11	15	15	15	15	9	12	13
Wind Dir (true/from)	ESE	ESE	S	S	SSW	SSW	WSW	WNW	NW	NW	NNW	NNW	NW	NNW	NW	NW	NNW
Wind Speed (km/h)	9	13	18	24	29	36	31	27	26	24	23	22	21	13	9	5	5
Gust Speed (km/h)	15	22	30	40	48	59	51	45	43	40	38	37	35	22	15	9	9

Outlook

Date	Mon Oct 26			Tue October 27 2015				Wed October 28 2015				Thu October 29 2015				Fri 30	
Time (EDT)	8	14	20	2	8	14	20	2	8	14	20	2	8	14	20	2	8
Rain / Showers																	
Temperature (C)	2	11	5	3	3	10	7	7	8	15	16	13	11	9	7	6	6
Cloud Cover (%)	0	0	0	0	10	20	60	80	100	100	100	100	40	80	20	80	60
Wind Dir (true/from)	NE	E	N	N	NNE	E	E	ESE	ESE	ESE	ESE	SW	SW	WSW	WSW	W	W
Wind Speed (km/h)	10	8	7	9	16	24	26	21	21	28	25	29	31	39	28	32	29
Gust Speed (km/h)	17	14	12	16	27	40	43	36	36	46	41	47	51	62	46	52	48

Duty Forecaster:

1-800-968-2044 or weather@amecfw.com

See Amec Foster Wheeler Forecast Interpretation Guide for detailed definition of forecast content

Forecast prepared according to ISO 9001:2008 QMS certified standards and procedures

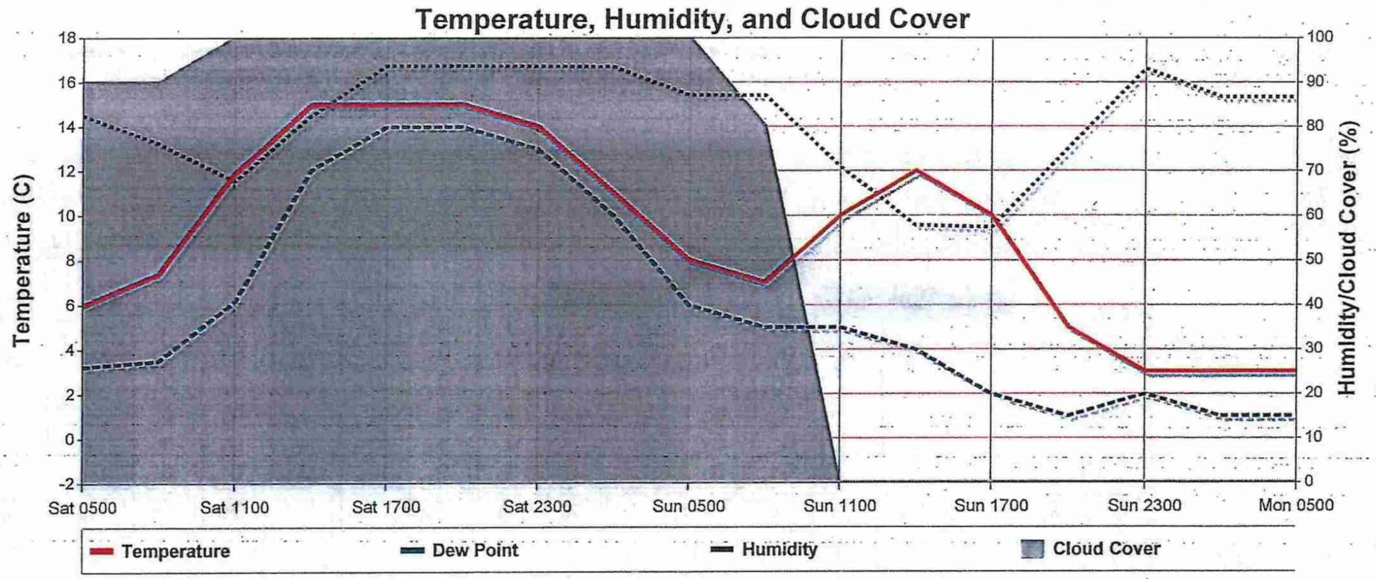
7-Day Forecast for the City of Hamilton

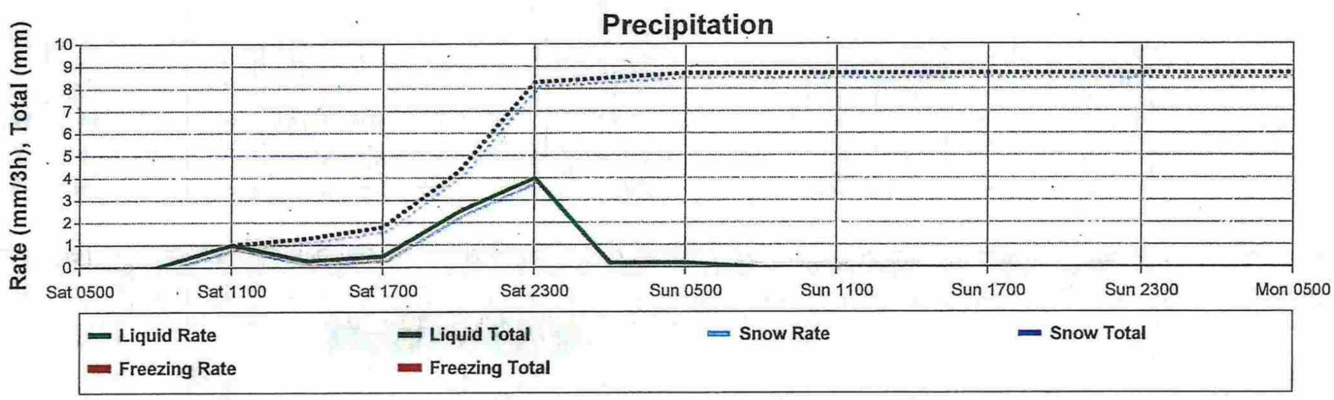
Amec Foster Wheeler Forecast for Hamilton - North Zone

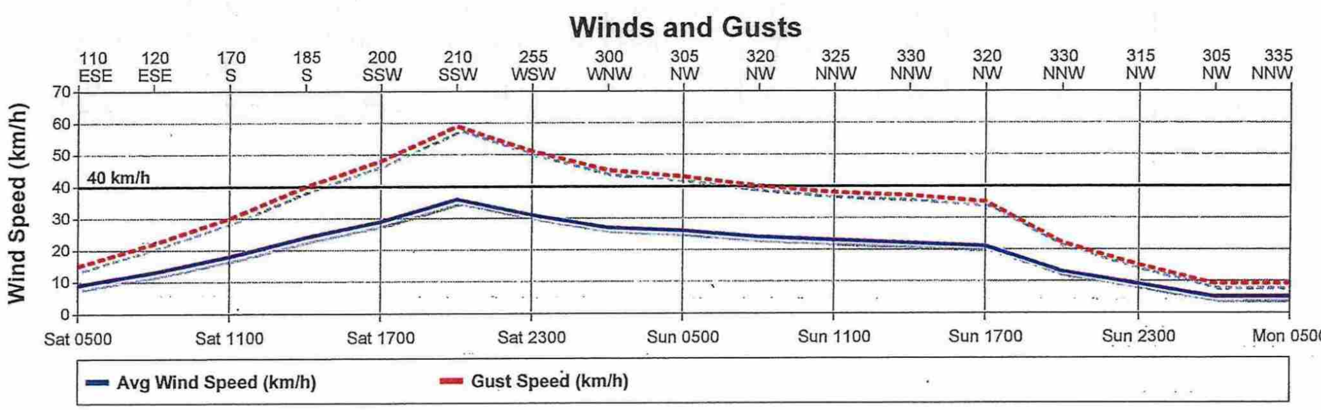
Hamilton

amec foster wheeler

Issued At: Saturday 24 October 2015 0600 EDT
Valid Until: Friday 30 October 2015 0800 EDT







Duty Forecaster:

1-800-968-2044 or weather@amecfw.com
See Amec Foster Wheeler Forecast Interpretation Guide for detailed definition of forecast content
Forecast prepared according to ISO 9001:2008 QMS certified standards and procedures

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7-Day Forecast for the City of Hamilton

Hamilton

Amec Foster Wheeler Forecast for Hamilton - North Zone

amec foster wheeler

Issued At: Saturday 24 October 2015 1400 EDT
Valid Until: Friday 30 October 2015 2000 EDT

Warning: NONE

Cloudy with showers, becoming periods of rain with a risk of thunderstorms in the evening as cold front sweeps across the region. Showers end early Sunday morning followed by clearing skies through the day as weak high pressure builds in. Partial clearing Monday with a chance of showers late day under a weak ridge.

Forecast

Date	Sat October 24 2015				Sun October 25 2015								Mon October 26 2015				
Period	Afternoon		Evening		Overnight		Morning		Afternoon		Evening		Overnight		Morning		
Hour Ending (EDT)	12 13 14	15 16 17	18 19 20	21 22 23	0 1 2	3 4 5	6 7 8	9 10 11	12 13 14	15 16 17	18 19 20	21 22 23	0 1 2	3 4 5	6 7 8	9 10 11	12 13 14
Rain																	
Showers																	
Drizzle																	
Thundershowers																	
Liquid Rate (mm/3h)	1	< 1	5	11	< 1	< 1	< 1	< 1	0	0	0	0	0	0	0	0	0
Freez. Rate (mm/3h)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snow Rate (cm/3h)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Liquid Accum. (mm)	1	2	7	18	19	19	19	19	19	19	19	19	19	19	19	19	19
Freez. Accum. (mm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Snow Accum. (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Time (EDT)	**14**	**17**	**20**	**23**	**02**	**05**	**08**	**11**	**14**	**17**	**20**	**23**	**02**	**05**	**08**	**11**	**14**
Temperature (C)	**10**	**13**	**15**	**14**	**10**	**8**	**7**	**9**	**11**	**10**	**5**	**4**	**2**	**0**	**-1**	**8**	**10**
Dew Point Temp (C)	9	13	14	13	9	6	5	5	3	2	2	2	-1	-3	-4	4	5
Humidity (%)	94	100	94	94	93	87	87	76	58	57	81	87	81	80	80	76	71
Wind Chill	-	-	-	-	-	-	-	-	-	-	-	2	1	-2	-3	-	-
Cloud Cover (%)	100	100	100	100	100	100	90	90	40	40	50	20	60	40	70	60	80
Visibility (km)	5	2	3	6	5	11	11	12	15	15	15	9	15	15	15	15	15
Wind Dir (true/from)	S	S	SSW	WSW	WNW	WNW	NW	NW	NW	NW	NNW	NNW	NNW	NE	NE	E	SSW
Wind Speed (km/h)	21	24	32	28	27	26	23	22	23	22	11	8	5	6	5	7	7
Gust Speed (km/h)	35	40	53	46	45	43	38	37	38	37	19	14	9	10	9	12	12

Outlook

Date	26	Tue October 27 2015				Wed October 28 2015				Thu October 29 2015				Fri October 30 2015			
Time (EDT)	**20**	**2**	**8**	**14**	**20**	**2**	**8**	**14**	**20**	**2**	**8**	**14**	**20**	**2**	**8**	**14**	**20**
Rain																	
Showers																	
Temperature (C)	**7**	**4**	**4**	**11**	**9**	**8**	**11**	**15**	**16**	**14**	**8**	**6**	**6**	**6**	**6**	**9**	**4**
Cloud Cover (%)	40	60	60	60	80	100	100	100	100	100	70	50	80	80	60	0	0
Wind Dir (true/from)	NE	ENE	NE	ESE	ESE	SE	SSE	S	SW	WSW	WSW	WSW	WSW	W	W	NW	NW
Wind Speed (km/h)	8	5	9	24	25	25	27	38	26	31	41	50	38	32	29	25	24
Gust Speed (km/h)	14	9	15	40	41	41	45	62	44	52	67	79	62	52	48	42	40

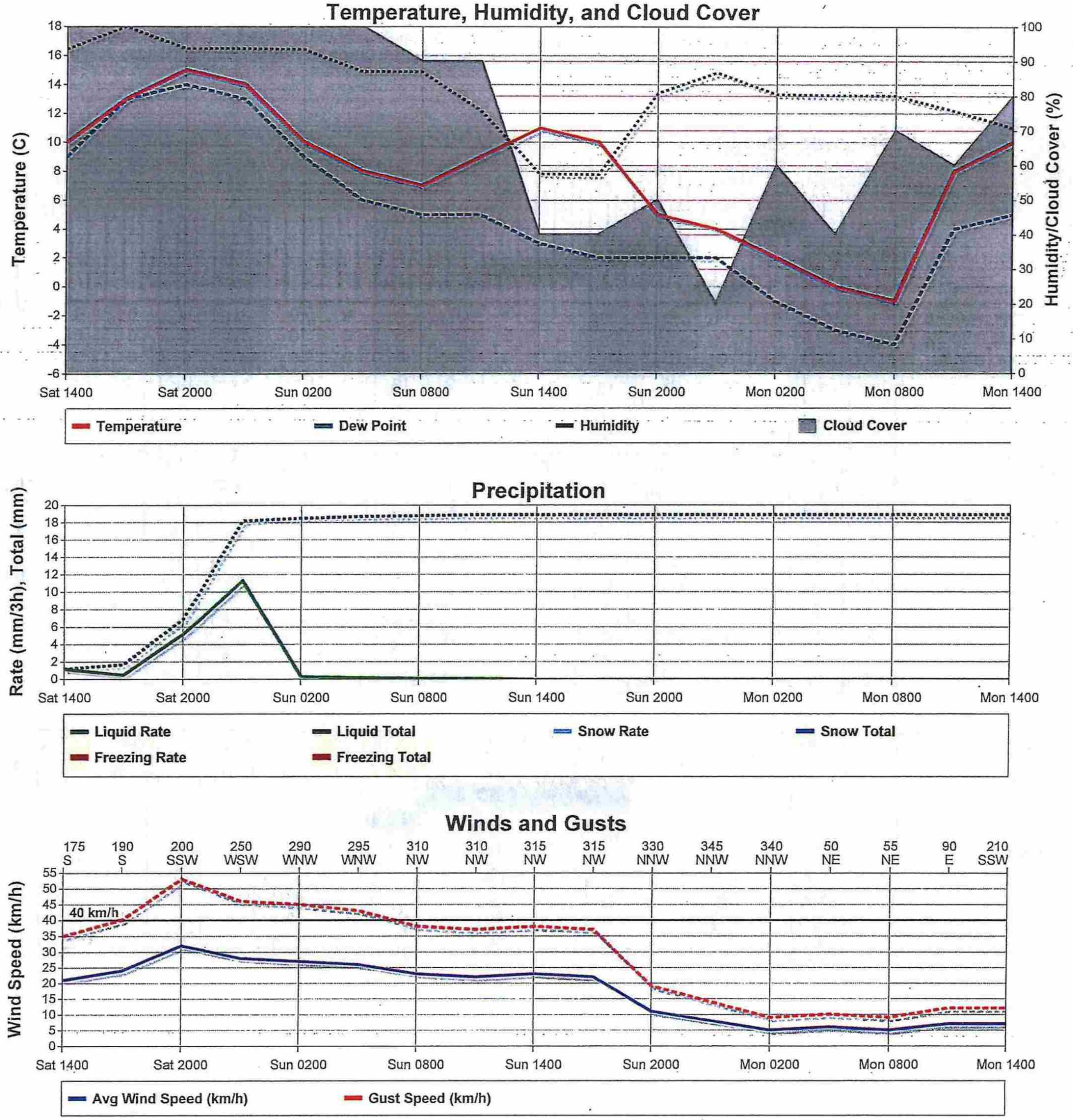
Duty Forecaster:

1-800-968-2044 or weather@amecfw.com
See Amec Foster Wheeler Forecast Interpretation Guide for detailed definition of forecast content
Forecast prepared according to ISO 9001:2008 QMS certified standards and procedures

7-Day Forecast for the City of Hamilton

Amec Foster Wheeler Forecast for Hamilton - North Zone

Issued At: Saturday 24 October 2015 1400 EDT
Valid Until: Friday 30 October 2015 2000 EDT



Duty Forecaster: 1-800-968-2044 or weather@amecfw.com

See Amec Foster Wheeler Forecast Interpretation Guide for detailed definition of forecast content

Forecast prepared according to ISO 9001:2008 QMS certified standards and procedures

Government of Canada Gouvernement du Canada

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Daily Data Report for October 2015

HAMILTON RBG CS
ONTARIO

Latitude:	43°17'30.000" N
Longitude:	79°54'30.000" W
Elevation:	102.00 m
Climate ID:	6153301
WMO ID:	71297
TC ID:	XHM

DAY	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
01 †	14.2	6.0	10.1	7.9	0.0	M	M	0.0		5	41
02 †	12.8	6.6	9.7	8.3	0.0	M	M	0.0		7	52
03 †	11.7E	10.1E	10.9E	7.1E	0.0E	M	M	M		9	56
04 †	14.6	10.1	12.4	5.6	0.0	M	M	0.0			<31
05 †	14.5	9.8	12.2	5.8	0.0	M	M	0.2			<31
06 †	17.4	9.7	13.6	4.4	0.0	M	M	0.2			<31
07 †	22.6	7.4	15.0	3.0	0.0	M	M	0.2			<31

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	Max Temp °C	Min Temp °C	Mean Temp °C	Heat Deg Days	Cool Deg Days	Total Rain mm	Total Snow cm	Total Precip mm	Snow on Grnd cm	Dir of Max Gust 10's deg	Spd of Max Gust km/h
08 †	16.0	4.6	10.3	7.7	0.0	M	M	5.0			<31
09 †	17.2	5.9	11.6	6.4	0.0	M	M	1.2		32	37
10 †	17.5	4.6	11.1	6.9	0.0	M	M	0.0			<31
11 †	22.7	10.3	16.5	1.5	0.0	M	M	0.0		25	39
12 †	23.0	13.8	18.4	0.0	0.4	M	M	0.0		20	33
13 †	19.1	11.5	15.3	2.7	0.0	M	M	0.0		29	43
14 †	14.2	3.4	8.8	9.2	0.0	M	M	0.0			<31
15 †	19.6	5.0	12.3	5.7	0.0	M	M	5.8		26	48
16 †	14.6	1.6	8.1	9.9	0.0	M	M	1.4		27	52
17 †	8.9	-1.3	3.8	14.2	0.0	M	M	0.0			<31
18 †	9.3	-2.6	3.4	14.6	0.0	M	M	0.0			<31
19 †	16.6	-3.4	6.6	11.4	0.0	M	M	0.0		21	41
20 †	19.7	11.5	15.6	2.4	0.0	M	M	1.6		27	41
21 †	17.9	10.4	14.2	3.8	0.0	M	M	0.8			<31
22 †	M	10.4E	M	M	M	M	M	M		31	32
23 †	9.2	1.7	5.5	12.5	0.0	M	M	0.0			<31
24 †	17.9	7.3	12.6	5.4	0.0	M	M	13.4		20	39
25 †	14.8	2.1	8.5	9.5	0.0	M	M	0.0		30	37
26 †	11.5	1.0	6.3	11.7	0.0	M	M	0.0			<31
27 †	10.8	1.5	6.2	11.8	0.0	M	M	0.0		6	33
28 †	16.7	8.9	12.8	5.2	0.0	M	M	45.8		5	33
29 †	14.3	6.4	10.4	7.6	0.0	M	M	0.8		23	61
30 †	11.2	-1.2	5.0	13.0	0.0	M	M	0.0			<31
31 †	11.3	-1.7	4.8	13.2	0.0	M	M	2.2			<31
Sum				228.4^	0.4^	M	M	78.6^			
Avg	15.4^	5.5	10.4^								
Xtrm	23.0^	-3.4								23	61

Summary, average and extreme values are based on the data above.

Legend

- A = Accumulated
- C = Precipitation occurred, amount uncertain
- E = Estimated
- F = Accumulated and estimated
- L = Precipitation may or may not have occurred
- M = Missing

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- N = Temperature missing but known to be > 0
- S = More than one occurrence
- T = Trace
- Y = Temperature missing but known to be < 0
- [empty] = No data available
- ^ = The value displayed is based on incomplete data
- † = Data for this day has undergone only basic quality checking
- ‡ = Partner data that is not subject to review by the National Climate Archives

Date modified:

2018-01-11

Government of Canada Gouvernement du Canada

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Hourly Data Report for October 24, 2015

All times are specified in Local Standard Time (LST). Add 1 hour to adjust for Daylight Saving Time where and when it is observed.

HAMILTON RBG CS
ONTARIO

Latitude:	43°17'30.000" N
Longitude:	79°54'30.000" W
Elevation:	102.00 m
Climate ID:	6153301
WMO ID:	71297
TC ID:	XHM

TIME	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
00:00	8.0	3.8	74	8	8		101.04			NA
01:00	8.0	3.1	71	6	6		100.95			NA
02:00	7.8	2.7	70	7	7		100.86			NA
03:00	7.6	2.9	72	5	6		100.80			NA
04:00	7.6	3.3	74	3	2		100.77			NA

	Temp °C	Dew Point Temp °C	Rel Hum %	Wind Dir 10's deg	Wind Spd km/h	Visibility km	Stn Press kPa	Hmdx	Wind Chill	Weather
05:00	7.6	3.7	77	4	5		100.68			NA
06:00	8.0	4.0	76	5	4		100.64			NA
07:00	8.2	4.2	76	5	4		100.58			NA
08:00	8.8	4.7	76	4	1		100.53			NA
09:00	9.1	6.6	84	21	1		100.49			NA
10:00	9.7	6.5	80	3	2		100.45			NA
11:00	10.5	7.1	80	5	3		100.36			NA
12:00	10.8	7.9	82	9	2		100.30			NA
13:00	10.1	8.6	91	6	7		100.15			NA
14:00	10.9	9.4	91	4	3		100.05			NA
15:00	12.0	10.8	93	0	1		99.97			NA
16:00	13.0	11.7	92	5	3		99.85			NA
17:00	13.3	12.0	92	4	3		99.72			NA
18:00	16.1	14.0	87	23	7		99.68			NA
19:00	17.4	14.2	81	22	11		99.56			NA
20:00	17.8	14.6	82	21	9		99.49			NA
21:00	17.0	15.5	91	21	12		99.46			NA
22:00	16.9	15.0	88	27	12		99.56			NA
23:00	15.9	14.2	90	23	6		99.57			NA

Legend

- E = Estimated
- M = Missing

- NA = Not Available
- ‡ = Partner data that is not subject to review by the National Climate Archives

Date modified:

2018-01-11

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COURT FILE # [redacted]

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HANSEN v. **CITY OF HAMILTON et. al.**
Plaintiffs Defendant

Court File No.: 17-61728

ONTARIO

SUPERIOR COURT OF JUSTICE

Proceeding commenced at HAMILTON

AFFIDAVIT OF DOCUMENTS

CITY OF HAMILTON
Legal Services Division
21 King Street West, 12th Floor
Hamilton, Ontario L8P 4W7

DANA-ELISABETA LEZAU
LSUC No.: 52306D

Tel: (905) 546-2424 Ext. 4216
Fax: (905) 546-4370

Lawyers for the Defendant,
City of Hamilton

This is **Exhibit "E"** referred to in
the Affidavit of **Byrdena MacNeil**
sworn this 15th day of March, 2023

Olivia Eng
____
A Commissioner for Taking Affidavits

Court File No.: 17-61728

ONTARIO
SUPERIOR COURT OF JUSTICE

B E T W E E N:

SHANNON HANSEN and HEATHER HANSEN

Plaintiffs

- and -

MARK BERNAT and CITY OF HAMILTON

Defendants

VOLUME II
AFFIDAVIT OF DOCUMENTS

I, Marco Oddi, of the City of Hamilton, in the Province of Ontario, MAKE OATH AND SAY:

1. I am a Manager in the Engineering Services Division of the Public Works Department for the Defendant, City of Hamilton, which is a corporation.

2. I have conducted a diligent search of the corporation's records and made appropriate enquiries of others to inform myself in order to make this Affidavit. This Affidavit discloses, to the full extent of my knowledge, information and belief, all documents relevant to any matter in issue in this action that are or have been in the possession, control or power of the corporation.

3. I have listed in Schedule A those documents that are in the possession, control or power of the corporation and that it does not object to producing for inspection.

4. I have listed in Schedule B those documents that are or were in the possession, control or power of the corporation and that it objects to producing because it claims they are privileged, and I have stated in Schedule B the grounds for each such claim.

5. I have listed in Schedule C those documents that were formerly in the possession, control or power of the corporation but are no longer in its

possession, control or power and I have stated in Schedule C when and how it lost possession or control of or power over them and their present location.

6. The corporation has never had in its possession, control or power any documents relevant to any matter in issue in this action other than those listed in Schedules A, B, and C.

SWORN BEFORE ME at the)
City of Hamilton,)
in the Province of Ontario,)
this 3rd day of May, 2018)

A Commissioner, etc.

MARCO ODDI

LAWYER'S CERTIFICATE

I CERTIFY that I have explained to the deponent,

(a) the necessity of making full disclosure of all documents relevant to any matter in issue in the action; and,

(b) what kinds of documents are likely to be relevant to the allegations made in the pleadings.

Dated: May 3/18

DANA-ELISABETA LEZAU

SCHEDULE "A"

Documents in the corporation's possession, control or power that it does not object to producing for inspection.

PLEADINGS

All pleadings and proceedings relating to Court File No. 17-61728.

CORRESPONDENCE

No.	Date	Document	Sender	Recipient	No. of Pages
1.	December 18, 2015	Notice Letter	Nolan Glenn, Nolan Paralegals	City of Hamilton	2
2.	December 23, 2015	Correspondence	Adam Tollis, Cunningham Lindsey	Nolan Glenn, Nolan Paralegals	3
3.	February 25, 2016	Correspondence	Adam Tollis, Cunningham Lindsey	Nolan Glenn, Nolan Paralegals	1
4.	April 8, 2016	Correspondence	Adam Tollis, Cunningham Lindsey	Nolan Glenn, Nolan Paralegals	1

INVESTIGATION

No.	Date	Document	Sender/Creator	Recipient	No. of Pages
5.	October 1, 2013 – October 31 2015	Hansen Search, Red Hill Valley Parkway	Public Works, City of Hamilton		90
6.	October 2013	Red Hill Valley Parkway Safety Review	CIMA		114
7.	October 24, 2015	Amec Weather Forecast – Hamilton North Zone	Public Works, City of Hamilton		4
8.	October 24, 2015	Daily and Monthly Environment Canada Weather Records	Environment Canada		5
9.	October 24, 2015	Hamilton Police Service	Hamilton Police		28

		Records including Motor Vehicle Accident Report #15-739738, duty notes and 911 call on disc	Service		
10.	October 24, 2015	Hansen Printout re MVA # 15-739738	Public Works, City of Hamilton		1
11.	November 2015	Red Hill Valley Parkway Detailed Safety Analysis	CIMA		88
12.	April 4, 2016	Hamilton Strategic Road Safety Program Update	Public Works, City of Hamilton	Public Works Committee	18
13.	May 11, 2016	Information Update	Public Works, City of Hamilton	Mayor and City Council	3
14.	May 20, 2016	Information Update	Public Works, City of Hamilton	Mayor and City Council	4
15.	September 19, 2016	Information Report	Public Works, City of Hamilton	Public Works Committee	2
16.	October 3, 2016	Information Report	Public Works, City of Hamilton	Public Works Committee	4
17.	January 16, 2017	Information Report	Public Works, City of Hamilton	Public Works Committee	1
18.	March 24, 2017	Information Update	Public Works, City of Hamilton	Mayor and City Council	3
19.	April 13, 2017	Report - Five Year Statistical Analysis of Fatal Collisions in Hamilton	Hamilton Police Services Board		23
20.	May 19, 2017	Information Update	Public Works, City of Hamilton	Mayor and City Council	5
21.	April 20, 2018	26 Colour Photographs of accident location	Cunningham Lindsey		26

Hamilton

Service Request Information (Hansen)

13369561

SR # 13369561

Request Type TRRC - Road Closures/Barricades

Request Date 24/10/2015 17:44

Taken By 121475-0

Incident Date

Priority -

Responsibility TRAD - ROADS AFTER HOURS DAYS

Project -

Area WARD4-5

Sub-area

District

Map #

Reference #

Source

Last Modified By cagallant

Last Modified Date Time 23/02/2017 12:50:43

Reviewed By

Reviewed Date

Address RED HILL VALLEY PKY / BARTON ST E HAMILTON

Location pylons - at the Queenston southbound on ramp - officer on site

Additional Information police called back at 19:06 for barricade pick up - was on the phone with Sam and relayed the info for pick up

Inspection

Inspector 013956-0

Severity 1

Scheduled 24/10/2015 17:47 **Due By**

Started **Due By**

Completed **Due By**

Resolved 23/02/2017 12:50 **Due By**

Resolution TRPS - PROBLEM SOLVED

Contacts Information

Primary Caller

Customer Ref No

Name	Address	Day Phone	Eve/Cell Phone
police			

EMAIL

Call Date: 24/10/2015 05:44 pm **Taken By:** 121475-0

Customer Comments P15-739738

Logs

City of Hamilton

Red Hill Valley Parkway Detailed Safety Analysis

FINAL

November 2015

B000558

CIMA+
Partners in excellence

City of Hamilton

Red Hill Valley Parkway Detailed Safety Analysis

FINAL

November 2015

B000558

PREPARED BY:

Giovani Bottesini, P.Eng., M.Eng.

Khaled Hawash, B.Sc. Eng.

REVIEWED BY:

Maurice Masliah, Ph.D.

VERIFIED BY:

Brian Malone, P. Eng., PTOE

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1. Introduction and Background

The planning and design of the Red Hill Valley Parkway (RHVP) has a long history in Hamilton. In December of 1982, the original Environmental Assessment (EA) documents were filed by the former Region of Hamilton-Wentworth that outlined the need, scope and timing for the expansion of the Regional road network. The EA identified that a roadway connecting Highway 403 in Ancaster to the QEW in east Hamilton was required. The original design for the roadway was completed in 1985, and the EA was approved by the Province in 1987. A subsequent Preliminary Design Report for the RHVP was completed in January of 1990.

Construction of the Valley portion of the Parkway was begun in the early 1990s. Some aspects of funding, but not approvals, were halted and the project restarted in the mid-2000's. Construction of the Lincoln Alexander Parkway portion of the roadway went ahead and was completed in 1997, extending from Highway 403 to Dartnall Road.

In the early 1990's, the City entered into discussions with the Provincial government on how to further reduce impacts to the environment within the Valley section of the road. As a result of these discussions, in 1996, the City requested from the Province that they be allowed to undertake changes to the original designs and undertake a new EA. The Province approved this request in 1997 and work on the design changes and the new EA were begun and the City undertook an Impact Assessment and Design Process (IADP).

In 1999 the project was subject to panel hearing under the Canadian Environmental Assessment Act (CEAA). Construction in the Valley was placed on hold until 2002 when issues were resolved. In 2003 the design changes and the IADP were completed and construction on the Parkway recommenced. In 2007, the Red Hill Valley Parkway was opened to traffic and has been in operation since, forming part of a continuous connection from Highway 403 and the QEW in conjunction with the Lincoln Alexander Parkway. The road serves both intra-city traffic and inter-city traffic since it forms a connection between Niagara Region and South West Ontario.

Traffic volumes on the road are high, and, although Average Daily Traffic (ADT) has increased from approximately 46,000 vehicles in 2008, it has been oscillating between 55,000 and 59,000 from 2009 to 2014. Traffic conditions on the RHVP can become congested as the road reaches capacity, particularly during peak hours.

There were 474 collisions on the RHVP mainline between January 1, 2008 and July 23, 2015, an average of 62.5 collisions per year. There were 131 median related collisions, involving vehicles hitting guide rails/concrete barriers, resting on the grass median, or crossing over to the opposite direction during this time period, median related collisions were 28% of total collisions and include 1 fatal collision (2 fatalities) and 56 non-fatal injury collisions.

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2. Study Purpose

The purpose of this study is to review the safety and operational performance along the entire length of the RHVP (from the QEW interchange to the Dartnall Road interchange), and to identify measures that could potentially improve performance and reduce the number and/or the severity of collisions. In 2013, CIMA Canada Inc. (CIMA) conducted a safety review of the section of the RHVP between the Dartnall Road and Greenhill Avenue interchanges, providing a series of recommendations to improve safety.

This study has an extended area of review in comparison with the 2013 study, and particular focus has been paid to collisions related to the median and median crossover, as well as the potential need for illumination. The study completed the following tasks:

- Investigate the role of road-related factors in collisions;
- Complete a road safety assessment and field investigation;
- Evaluate of the need for and type of potential countermeasures, including median barrier system(s) and illumination; and
- Complete a benefit / cost analysis for all viable countermeasures.

The scope of the study does not allow for consideration of any major changes in the geometric design of the road including elements related to interchange spacing.

3. Study Area

The study area segment of the RHVP extends for 8.1 km, mostly in the north-south direction from approximately 500 m west of the Dartnall Road interchange in the south to the railway overpass approximately 500 m north of Barton Street in the north. The study area includes six full access interchanges of various design types. **Figure 1** illustrates the study area.

Figure 1: Study area

The RHVP is a 4-lane divided parkway between its north end and Greenhill Avenue, and a 5-lane divided parkway between Greenhill Avenue and its south end. In this section, there is an additional southbound lane due to the existing uphill grade. Controlled access is provided through interchanges with on and off ramps. The posted speed of the road is 90 km/h, and the design speed is assumed to be 110 km/h.

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The divider between directions is a raised grassy median for most of the length of the RHVP. The exception is a section starting close to the Mud Street West interchange and continuing north, 1,100 m, towards Greenhill Avenue where a concrete barrier divides the road. Occasionally, steel beam guide rails are present primarily to protect motorists from fixed object hazards such as overhead signs and bridge structures located within the median. The median is buffered from the travel lanes by a paved shoulder. The median is flush, and there is no curb and gutter.

The roadway is not continually illuminated. Partial illumination is available at exit and entrance ramps.

Based on traffic counts provided by the City for a permanent count station located near Queenston Road, two-way Average Daily Traffic (ADT) for the RHVP ranges approximately between 55,000 and 60,000 (**Table 1**). Due to limited data available to determine Average Annual Daily Traffic (AADT), these volumes are daily averages over 1-week periods in the months of May or October. These months were selected by the City based on consistency of available data over the years.

Table 1: RHVP average daily traffic

Year	Week	ADT
2008	October 20 – 26	45,749
2009	October 19 – 26	55,833
2010	October 18 – 25	59,123
2011	May 1 – 8	55,406
2012	May 20 – 26	57,812
2013	Data not available	
2014	May 21 – 27	58,444
2015	Data available only for Winter and Summer	

4. Review of Collisions

Collision data was reviewed to gain an in-depth understanding of the safety issues within the study area. CIMA reviewed the results of the collision analysis provided by the City, which was conducted for the period from January 1, 2008 (following opening of the RHVP) to July 23, 2015 (latest data available). CIMA conducted the review of collision characteristics in two parts. The first considered all types of collisions within the study area, which is detailed in Section 4.1. The second part considered only those collisions that are related to medians and is detailed in Section 4.2.

4.1 Review of Collision Characteristics Considering All Collisions

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The study area experienced a total of 474 collisions during the period from January 1, 2008 to July 23, 2015. The data, broken down by collision severity, is summarized in **Figure 2**. There were 4 fatal collisions (resulting in 5 fatalities), 205 injury collisions, and 265 Property Damage Only (PDO) collisions.

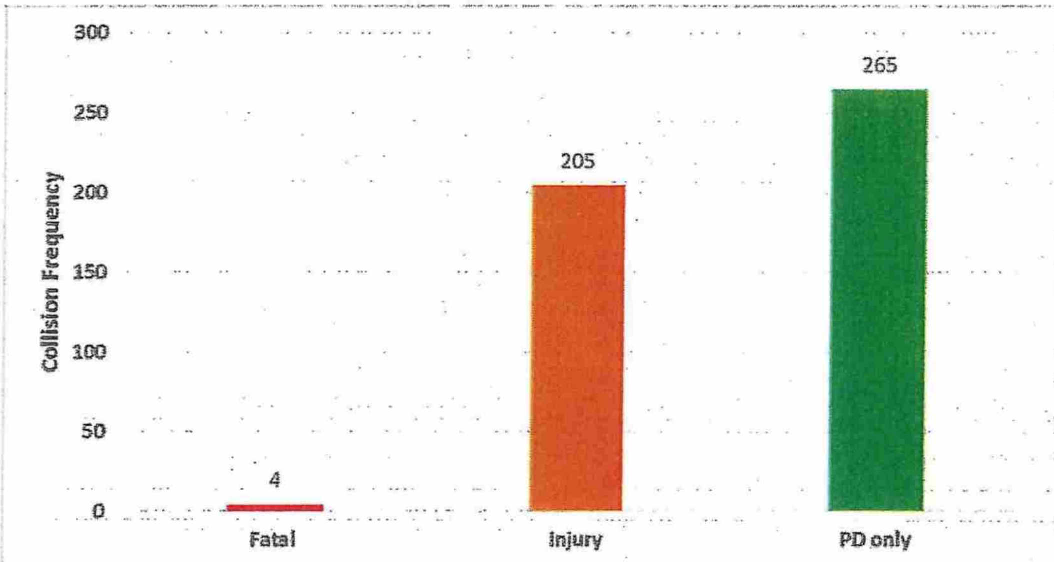

Figure 2: Collision severity

11 L vro me d od r e o d o

Figure 3 through **Figure 5** summarizes the collisions in the study area, broken down by light, environment and road surface condition.

The majority of collisions occurred under daylight/daylight artificial conditions, with a total of 300 out of 474 collisions (63.3%), with the remaining 174 (36.7%) collisions occurring during non-daylight conditions, which include dark/dark artificial, dusk/dusk artificial, and dawn/dawn artificial. When compared to the Provincial average of 30.7%[1] and the City of Hamilton average of 36.3%[2], and based on a Chi-Square statistical test, the proportion of collisions under non-daylight condition is significantly higher, however the range of this distribution can be considered normal. Details about the statistical test can be found in **Appendix A**, and a discussion regarding the need for illumination in the study area can be found in **Section 6 – Illumination Review.**

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[1] Ontario Road Safety Annual Report (ORSAR), Ontario Ministry of Transportation, 2012.

[2] 2008-2010 Traffic Safety Status Report, City of Hamilton, 2010.

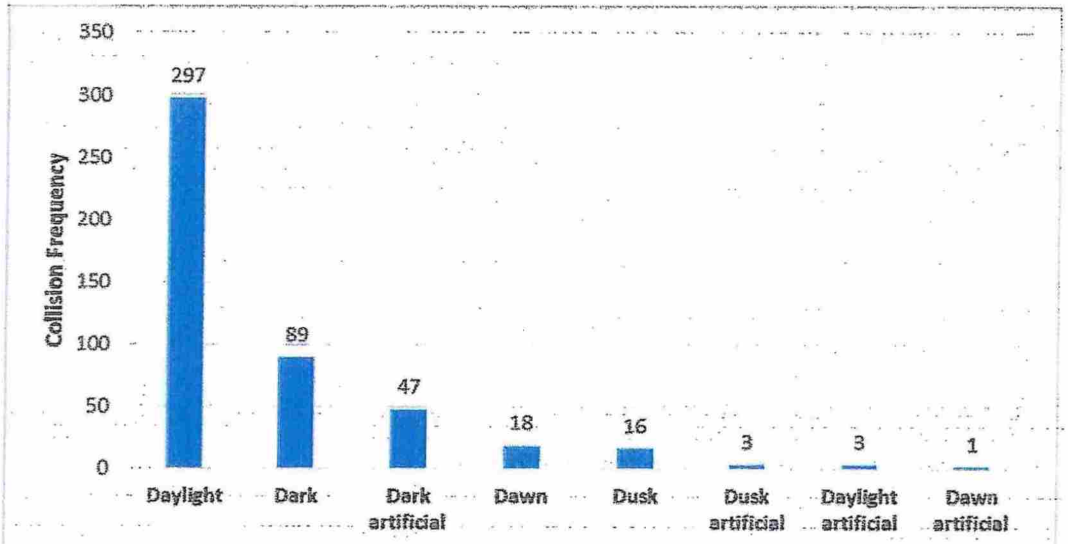

Figure 3: Collisions by light condition

With respect to environment condition, 275 out of 474 collisions (58.0%) occurred with clear weather; 160 (33.7%) with rainy weather, and the remaining collisions with other weather conditions, including snow, drifting snow, freezing rain, strong wind, and fog/mist/smoke/dust. Compared to the Provincial average of 10.9%[3] and the overall City of Hamilton average of 13.4%[4], and based on a Chi-Square statistical test, the proportion of collisions under rainy weather is significantly higher. Details about the statistical test can be found in **Appendix A**.

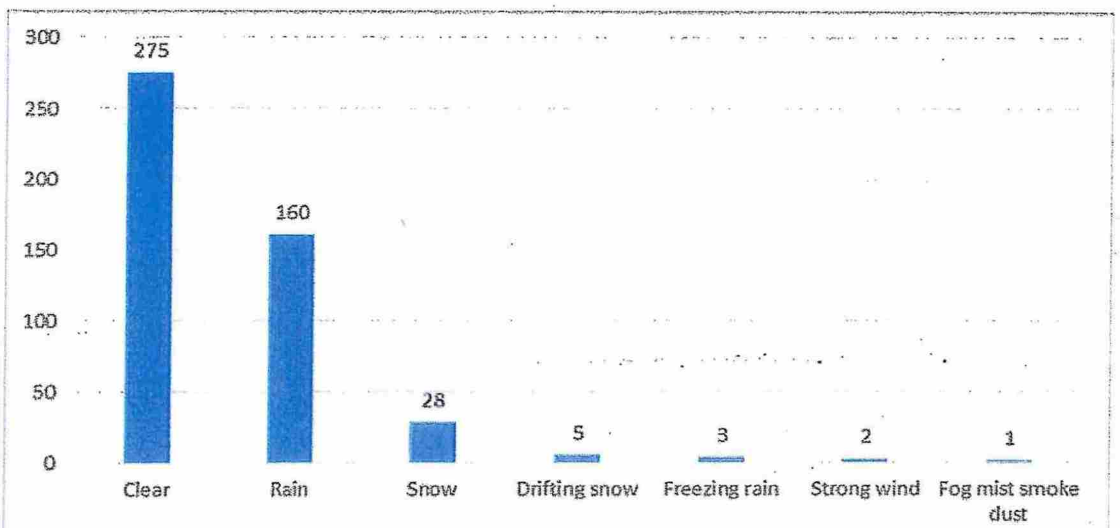

Figure 4: Collisions by environment condition

[3] Ontario Road Safety Annual Report (ORSAR), Ontario Ministry of Transportation, 2012.
[4] 2008-2010 Traffic Safety Status Report, City of Hamilton, 2010.

Wet surface collisions make up the majority of collisions in the study area, with 50.4% (239 out of 474), followed by dry surface with 43.9% (208 out of 474). When compared to the Provincial average of 17.6% and the City of Hamilton average of 22%, and based on a Chi-Square statistical test, the proportion of collisions under wet road surface is significantly higher. Details about the statistical test can be found in **Appendix A**.

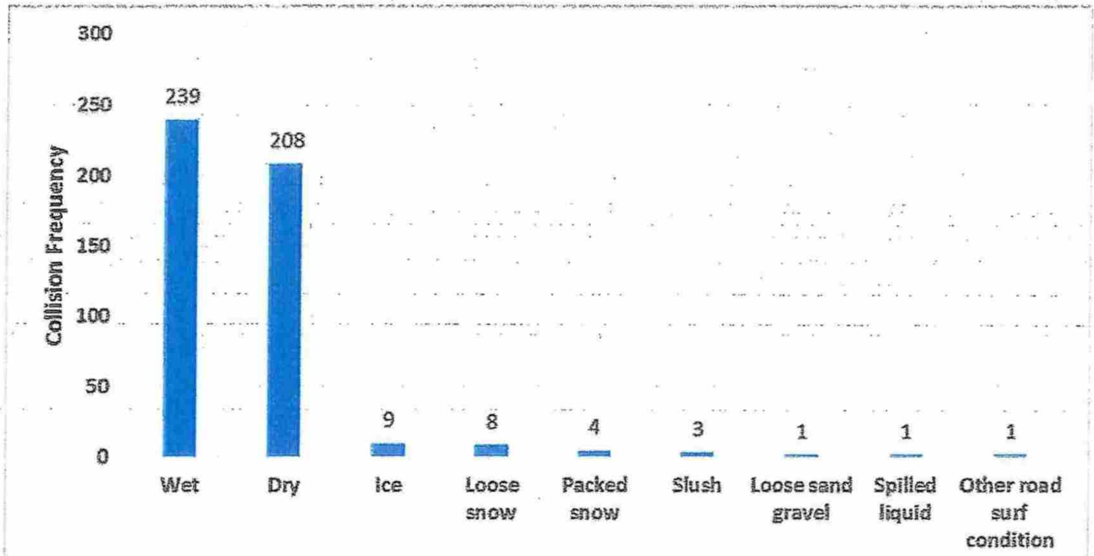

Figure 5: Collisions by road surface condition

4.1.2 Collision Impact Type

Figure 6 summarizes collisions by impact type and by roadway surface condition.[5] Single motor vehicle collisions (SMV) collisions are the most prevalent collision type with 208 incidents of a total of 474 collisions (44%). Rear end and sideswipe collisions with 116 (24%) and 108 (23%) incidents, respectively, were the next most common collision types.

Out of the 208 SMV collisions, 117 (56.3%) occurred under wet surface conditions, as well as 45 out of 116 rear end collisions (38.8%) and 56 out of 108 sideswipe collisions (51.9%).

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[5] Due to the high proportion of wet surface collisions, as discussed in Section 4.1.1, all remaining sections of the collision review will be combined with wet surface collisions.

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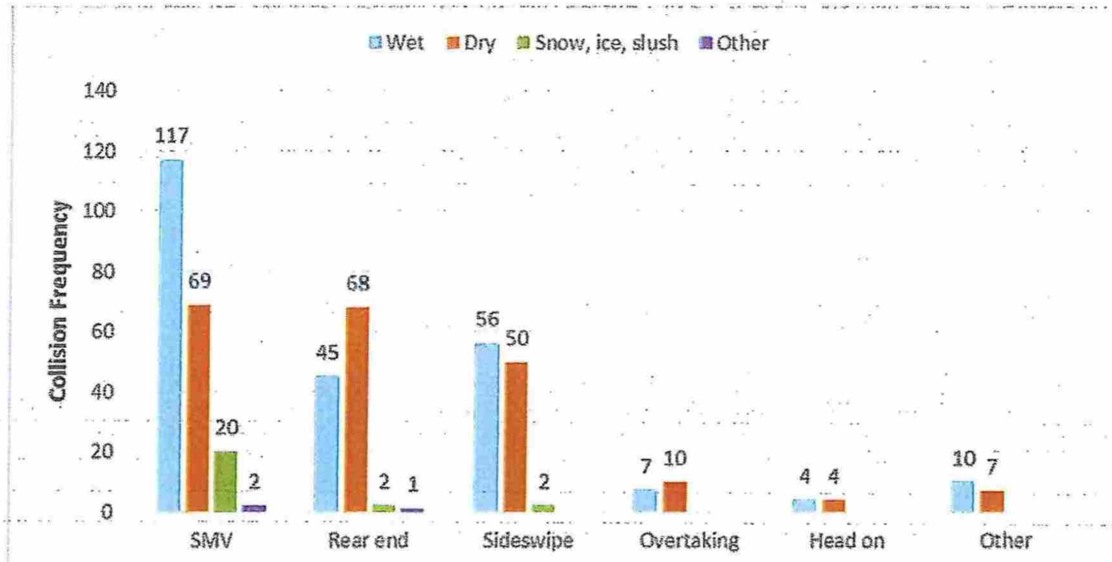

Figure 6: Collisions by impact type and roadway surface condition

4.1.3 Apparent Driver Action

Figure 7 summarizes the collisions in the study area according to the apparent driver action, including total collisions and wet surface collisions. The most frequent apparent driver action reported is "lost control", with 165 out of 474 collisions (34.8%), followed by "driving properly" (23.4%), "speed too fast" (12.4%), "following too close" (10.1%), and "improper lane change" (9.9%).

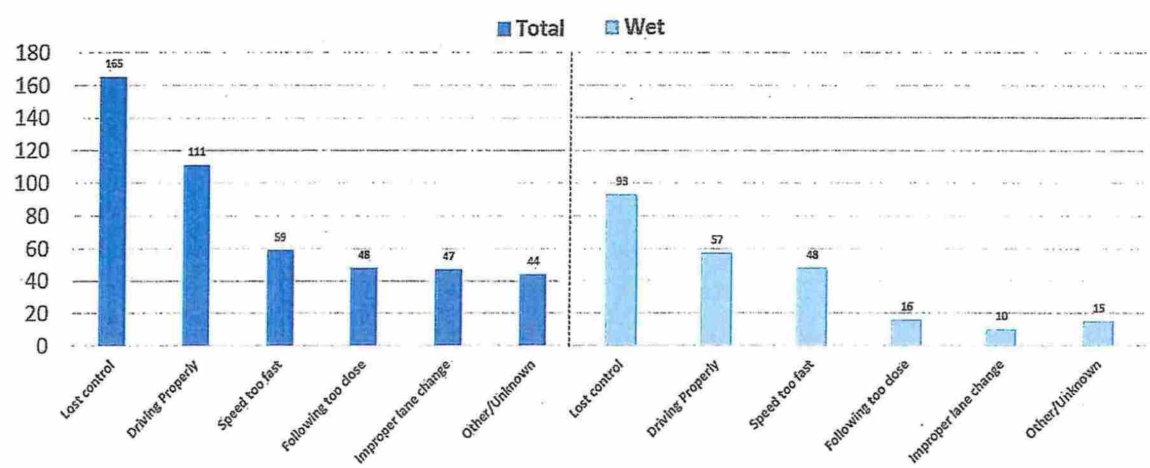

Figure 7: Apparent driver action

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Table 2 provides a comparison of the different apparent driver actions reported in the study area with average proportions for the Province of Ontario and for the City of Hamilton. With the exception of "following too close", all improper driver actions are significantly higher (based on a Chi-Square

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statistical test) than the provincial and municipal averages. The most outstanding discrepancy is "lost control", with a proportion over five times higher than the municipal average. In the table, the numbers in red indicate a significant difference between the study area and the comparison jurisdictions.

Table 2: Apparent driver action comparison

Apparent Driver Action	Study Area	Ontario	Hamilton
Driving properly	23.4%	50.6%	48.9
Lost control	34.8%	9.0%	6.6%
Speed too fast[6]	12.4%	2.7%	5.5%
Following too close	10.1%	7.9%	9.9%
Improper lane change	9.9%	2.3%	3.4%

With respect to wet surface collisions, the proportions of the different apparent driver actions are generally similar to total collisions, as summarized in **Table 3**. "Speed too fast", however, stands out due to 81.4% of collisions involving this apparent driver action (48 out of 59 – refer to **Figure 7**) having occurred on wet surface.

Table 3: Apparent driver action for total and wet surface collisions

Apparent Driver Action	Total Collisions	Wet Surface Collisions
Driving properly	23.4%	23.8%
Lost control	34.8%	38.9%
Speed too fast[7]	12.4%	20.1%
Following too close	10.1%	6.7%
Improper lane change	9.9%	4.2%

4.1.4 Spatial Distribution

Figure 8 provides the spatial distribution of major collision types[8] within the study area in each direction. The locations with the highest concentration of collisions are:

- Northbound direction:
  - Vicinity of the King Street interchange (200 m upstream of off-ramp to on-ramp); and
  - Vicinity of Mud Street on-ramp.
- Southbound direction:
  - Vicinity of King Street on-ramp;
  - Vicinity of Queenston Road on-ramp; and

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[6] Includes "speed too fast", "speed too fast for condition", and "exceeding speed limit".
[7] Includes "speed too fast", "speed too fast for condition", and "exceeding speed limit".
[8] Includes SMV, rear end, sideswipe, overtaking and head on. These collision types make up 96% of all collisions in the study area.

- Vicinity of Barton Street on-ramp.

Most of these locations have SMV collisions as the predominant collision type, the exception being Queenston Road southbound, where the predominant collision type is sideswipe (which is the second predominant collision type at the above mentioned locations, followed by rear end).

Out of the 249 northbound collisions shown in **Figure 8**, 78 (31%) are concentrated in a 600-metre section around the King Street interchange (between 250 metres south of the King Street off-ramp and the King Street on-ramp), a relatively short section of the 8.1 km study area. There were also 16 (6.4%) northbound collisions over a short 100-metre section near the Mud Street on-ramp.

Out of the 208 southbound collisions shown in **Figure 8**, 19 (9.1%), 21 (10.1%) and 22 (10.5%) are concentrated in 100-metre sections near the on-ramps of Queenston Road, Barton Street and King Street, respectively.

All locations mentioned above are within, on approach to, or leaving a horizontal curve, although some of these curves have a larger curve radius (e.g. Barton Street) and some have a smaller curve radius (e.g. King Street).

Figure 9 provides the spatial distribution of comparing dry and wet surface collisions. In the northbound direction, the ratio of wet to dry surface condition collisions around the King Street interchange is 4.33 wet surface collisions for each dry surface collision. In the southbound direction, this proportion is 3 to 1 near the Queenston Avenue on-ramp, and 2.5 to 1 near the King Street and the Barton Street on-ramps. These ratios exceed the normal expectation of more dry surface than wet surface collisions.

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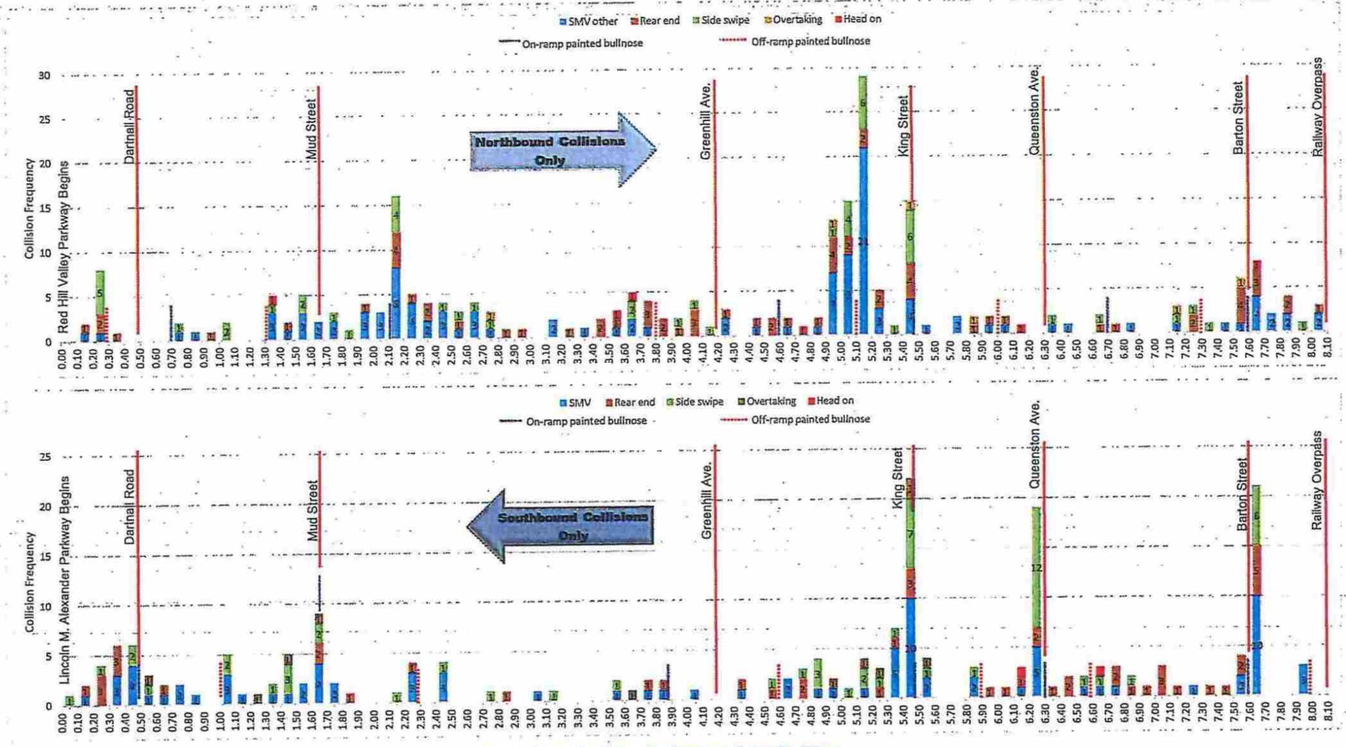

Figure 8: Spatial distribution of collisions considering all collisions

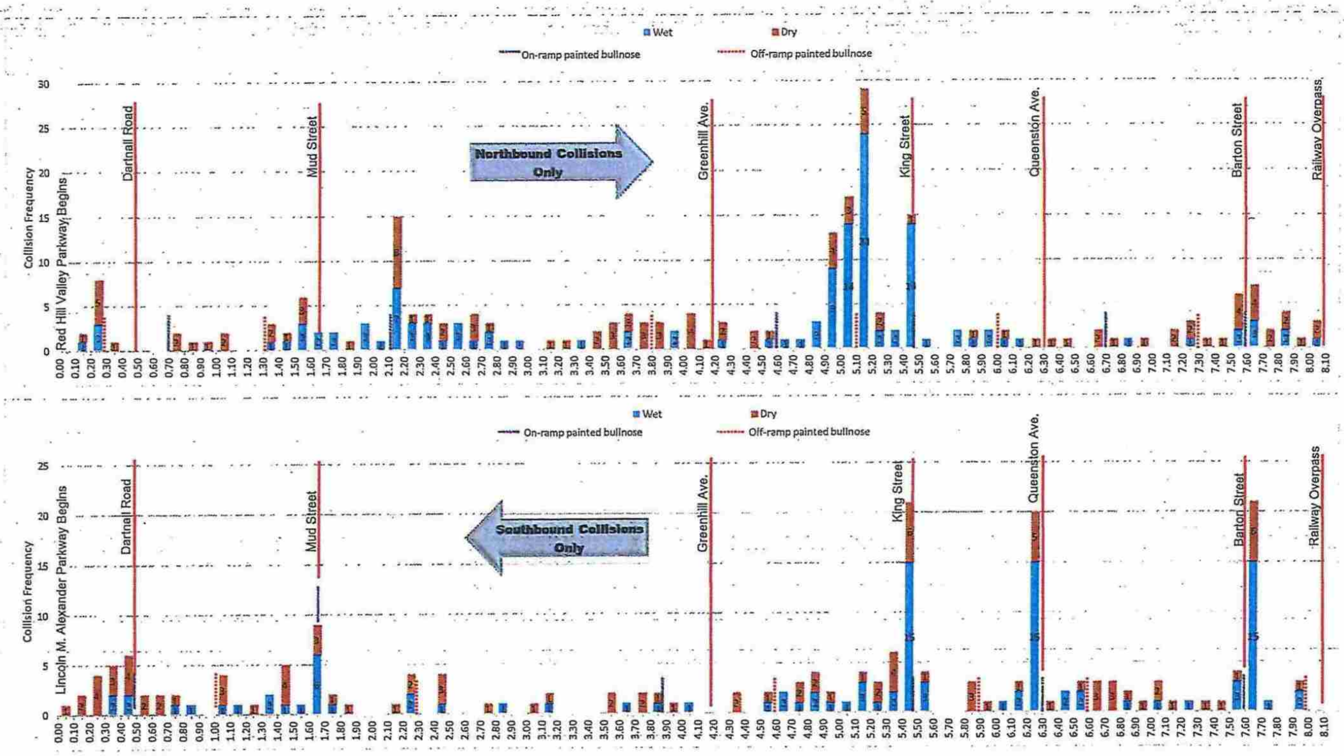

Figure 9: Spatial distribution of wet vs. dry surface collisions

4.2 Median Related Collisions

The Motor Vehicle Collision (MVC) reports were manually screened to identify median related collisions. The collisions related to median can be grouped into three types:

- Collisions crossing over the median; where vehicles travelled across the centre median and entered the opposing lanes of traffic;
- Collisions mounting the median; where a vehicle ran-off the road and came to rest on the median, not entering opposing lanes of traffic; and,
- Collisions involving a guide rail or concrete barrier installed on the median (left) side of the road; where a vehicle hit the guide rail or concrete barrier and then rested in the same initial direction of travel, not mounting or crossing the median.

21 o o ever

There were 131 (28% of all collisions) median related collisions from January 1, 2008 to July 23, 2015 as illustrated in **Figure 10**. This is a collision frequency of 2.13 collisions / year / km. The number includes:

- 1 fatal collision (crossing over the median; 2 fatalities);
- 56 injury collisions (9 crossing over the median, 17 resting on the median, and 30 involving guide rail/concrete barrier); and
- 74 PDO collisions (7 crossing over the median, 26 resting on the median and 41 involving guide rail/concrete barrier).

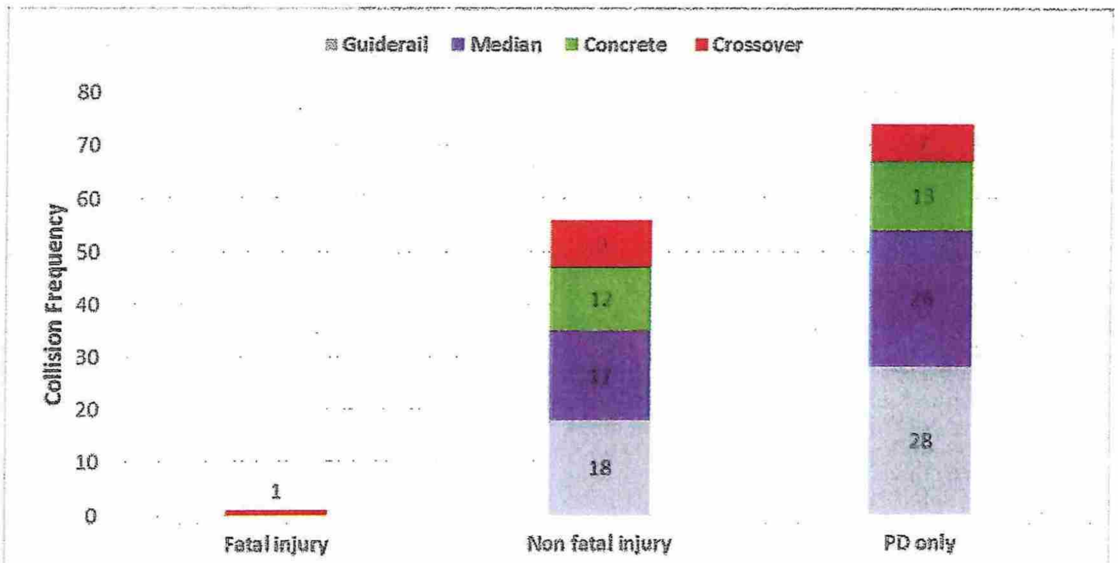

Figure 10: Summary of median related collisions

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As can be seen in **Figure 10**, 59% (10 out of 17) of the crossover collisions are severe, a higher proportion than median collisions (17 out of 43 or 40%), concrete barrier collisions (12 out of 25 or 48%), and guide rail collisions (18 out of 46 or 39%). As a result, the need for a median barrier will be investigated in this study.

22 L vro me d o d r e o d o

Figure 11 through **Figure 13** summarize the median related collisions in the study area, broken down by light, environment and road surface condition.

The majority of collisions occurred under daylight/daylight artificial conditions, with a total of 81 out of 131 collisions (62%), with the remaining 50 (38%) collisions occurring during non-daylight conditions, which include dark/dark artificial, dusk/dusk artificial, and dawn/dawn artificial. These proportions are very similar to the proportions for all collisions (**Section 4.1.1**).

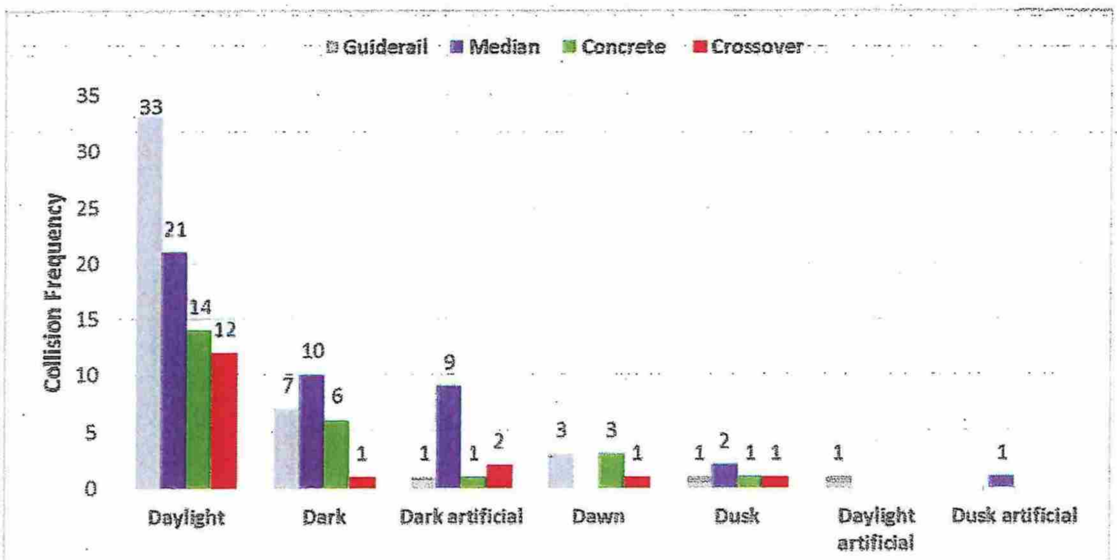

Figure 11: Median related collisions by light condition

With respect to environment condition, 68 out of 131 collisions (52%) occurred with clear weather; 50 (38%) with rainy weather, and the remaining collisions with other weather conditions, including snow, drifting snow, freezing rain, strong wind, and fog/mist/smoke/dust. These proportions are somewhat similar to the proportions for all collisions (**Section 4.1.1**), although non-clear weather conditions are slightly higher for median related collisions than for overall collisions (48% and 42%, respectively).

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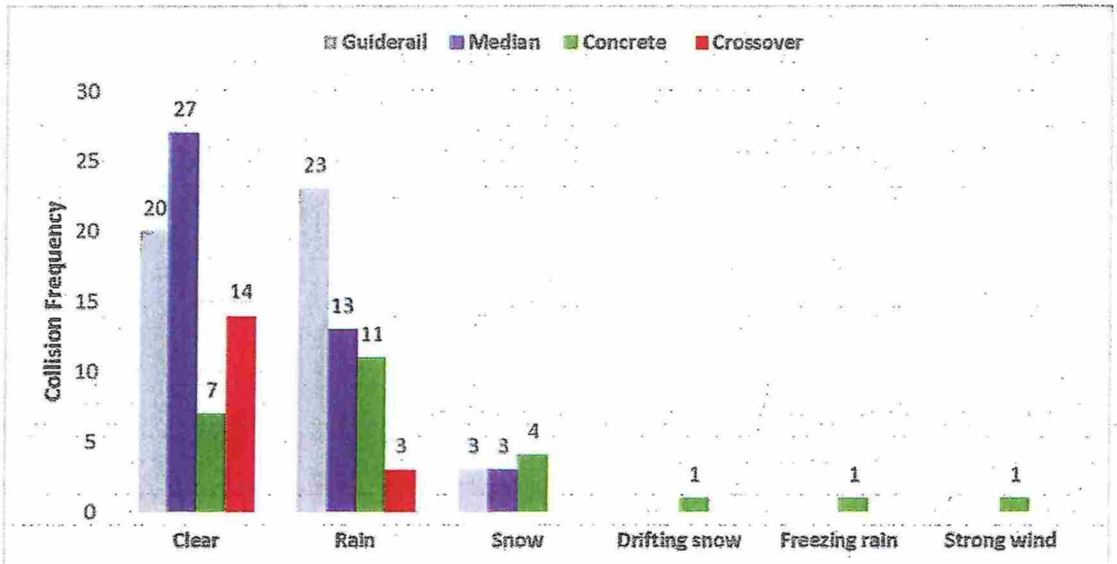

Figure 12: Median related collisions by environment condition

Wet surface collisions make up the majority of median related collisions in the study area, with 53% (70 out of 131), followed by dry surface with 41% (54 out of 131). These proportions are somewhat similar to the proportions for all collisions (**Section 4.1.1**).

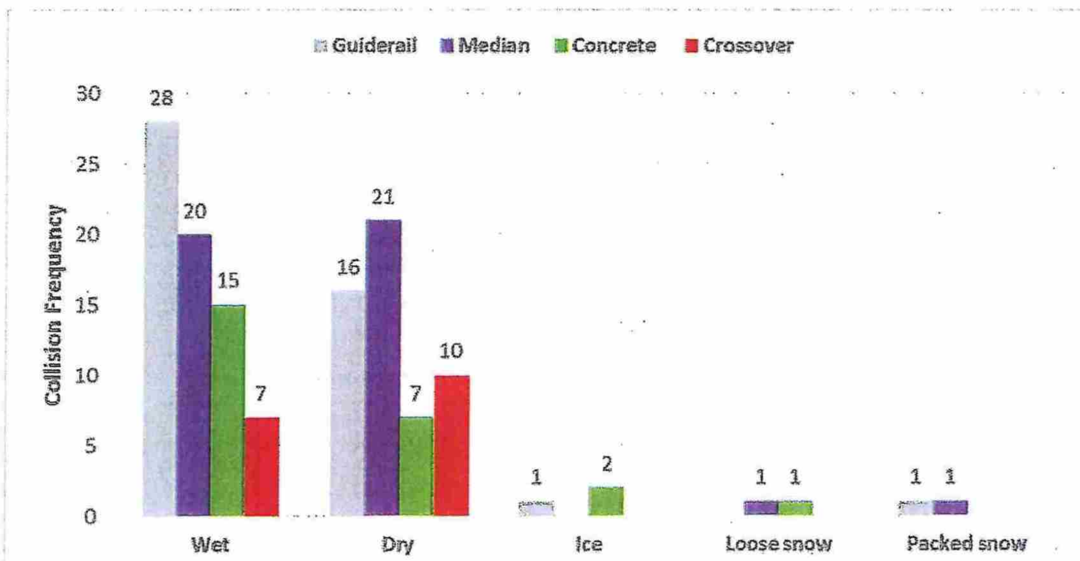

Figure 13: Median related collisions by roadway surface condition

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2 A re r ver A o

Figure 14 summarizes the median related collisions in the study area according to the apparent driver action. The most frequent apparent driver action reported is "lost control", with 60 out of 131 collisions (46%), followed by "speed too fast" (18%), "driving properly" (17%), and "improper lane change" (8%). The proportions of "lost control" and "speed too fast" are 11 and 6 percent points higher than for all collisions (as shown in **Section 4.1.3**). Additionally, 43.5% of median related, wet surface collisions involved "lost control" driver action, as well as 29% "speed too fast".

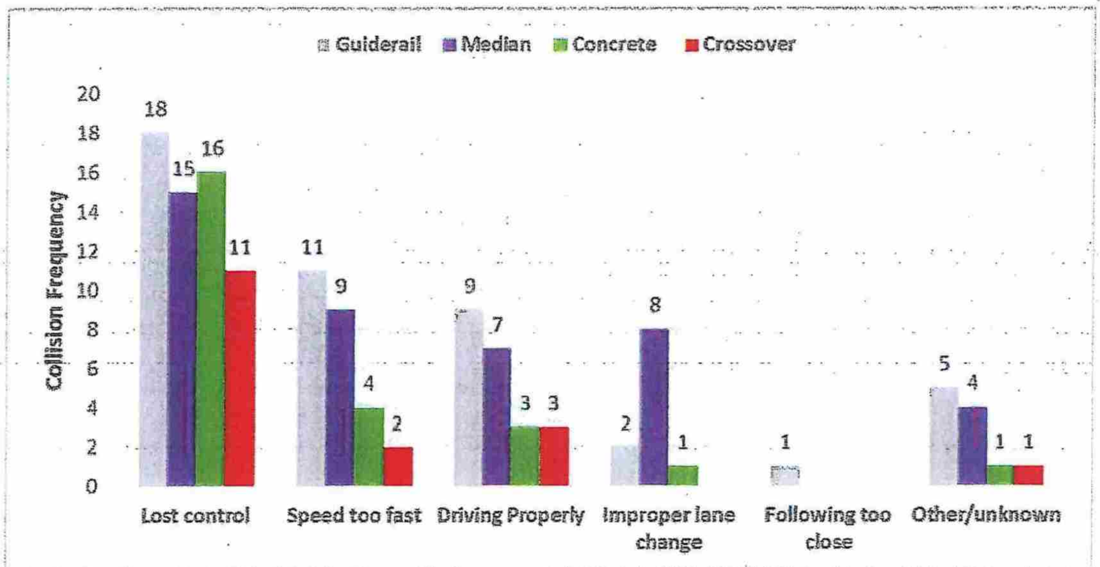

Figure 14: Median related collisions by apparent driver action

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Figure 15 provides the spatial distribution of all collisions and median related collisions within the study area in the northbound and the southbound directions.

A considerable proportion of median related collisions are concentrated in the vicinity of the King Street and Queenston Road interchanges. In the northbound direction, 32 out of 81 median related collisions (40%) are concentrated within a 600-metre section of road (between 250 metres south of the King Street off-ramp and the King Street on-ramp), equivalent to approximately 7.5% of the length of the study area. In the southbound direction, 19 out of 50 median related collisions (38%) are concentrated within a 1,100-metre section of road (between the Queenston Road on-ramp and 250 metres south of the King Street on-ramp), equivalent to approximately 13.5% of the length of the study area. Considering both directions combined, 57 out of 131 median related collisions (44%) are concentrated within 1,400 metres or 17% of the study area (between 250 metres south of the King Street NB off-ramp and the Queenston Road SB on-ramp). There were 7 crossover collisions in this section of the RHVP, 41% of a total of 17 in the study area. Out of these, 4 occurred in the northbound direction and 3 in the southbound direction.

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The second highest concentration of median related collisions is located in the vicinity of the Mud Street interchange, with 25 collisions (19.5%) having occurred over a 1-km section of road (12.5% of the study area), 19 of which in the northbound direction (or 23.5% over 12.5% of the study area). However, a median concrete barrier is already present along most of this section.

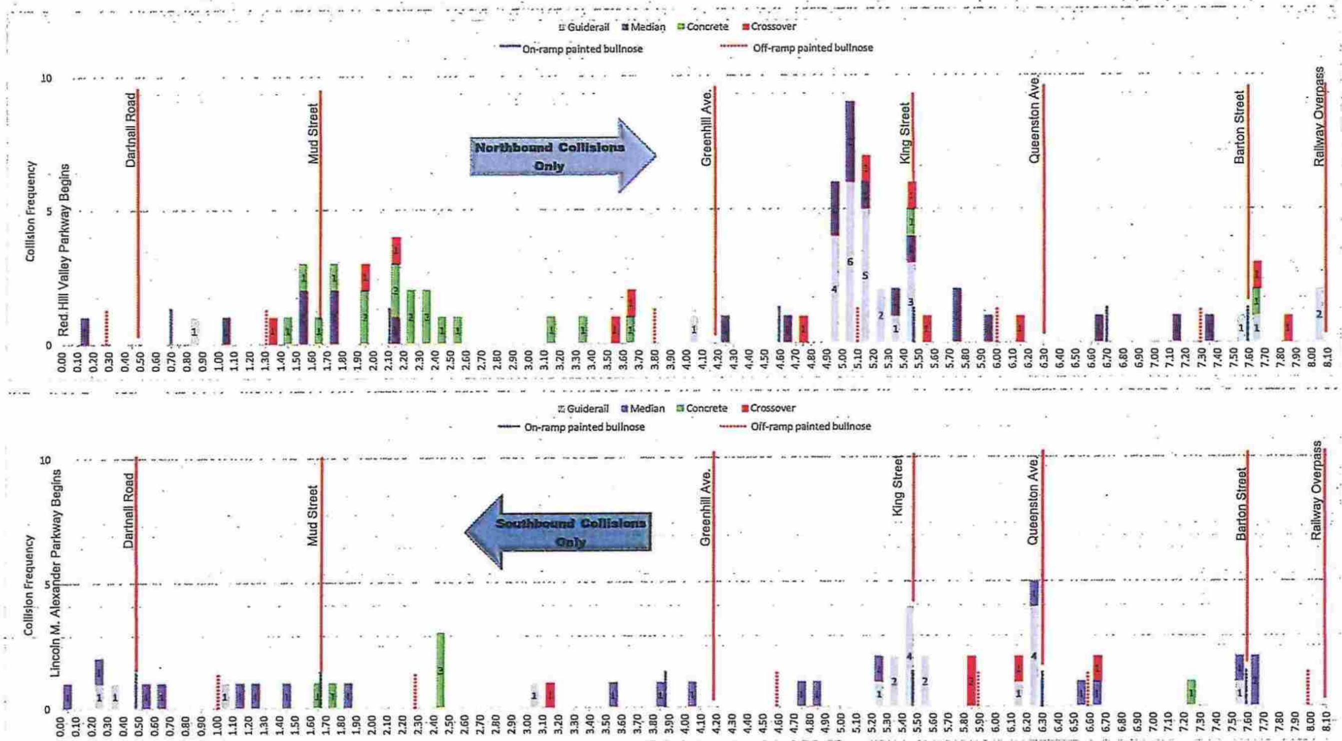

Figure 15: Spatial distribution of median related collisions

Out of the 57 reported collisions in the vicinity of King Street and Queenston Road, 36 had a vehicle striking the guiderail or concrete barrier, 14 had a vehicle ending up resting on the median, and 7 had a vehicle crossing over to the opposing traffic lanes. While 63% of median related collisions in this area are guide rail related, only 36% of this 1,400-metre section of the RHVP has guide rail installations on the median (used to protect fixed object hazards such as overhead sign and bridge structures). This may indicate that locations where median related collisions are more likely to occur are already protected. However, as shown in **Table 4**, crossover collisions, as expected, have a higher proportion of severe collisions than guide rail collisions. Conversely, median collisions have a lower proportion of severe collisions than guide rail collisions. Therefore, the determination of whether a median barrier should be provided throughout this entire section should be made based on a benefit/cost analysis.

Table 4: Median related collisions in the vicinity of King Street and Queenston Road

Median Related Collisions	Total	PDO	Severe
Guide rail/concrete	36	22 (61%)	14 (39%)
Median	14	10 (71%)	4 (29%)
Crossover	7	3 (43%)	4 (57%)

Finally, as discussed in **Section 4.2.2**, wet surface condition is present in 53% of median related collisions in the study area. When reviewing road surface condition for collisions in the vicinity of King Street and Queenston Road, however, it was found that this proportion increases to 74% (42 out of 57 collisions). This may indicate that addressing wet surface collisions could reduce median related collisions and significantly reduce the benefits of providing a median barrier.

4.3 Summary of Collision Review

Overall Findings

- Wet surface collisions were found to represent approximately 50% of all collisions in the study area, which is significantly high compared to typical proportions.
- Single Motor Vehicle (SMV) collisions amount to 44% of all collisions in the study area, followed by rear ends (24%) and sideswipes (23%).
  - 56% of SMV, 39% of rear end, and 52% of sideswipe collisions occurred under wet surface conditions.
- The most frequent apparent driver action reported was "lost control" (35%"), followed by "driving properly" (23%) and "speed too fast" (12%). Both "lost control" and "speed too fast" are significantly high compared to typical proportions.
  - Approximately four out of every five collisions where "speed too fast" was reported occurred under wet surface condition.

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Critical Locations

- The locations with the highest collision frequencies along the RHVP are:

- In the northbound direction, a 600-metre section around the King Street interchange (31% of northbound collisions over 7.5% of the RHVP length); and
- In the southbound direction, 100-metre sections near the on-ramps of the Queenston Road, Barton Street and King Street (combined, approximately 30% of southbound collisions over 3.7% of the RHVP length).
- All locations with the highest collision frequencies are located within, on approach to, or leaving horizontal curves (**Figure 16**).

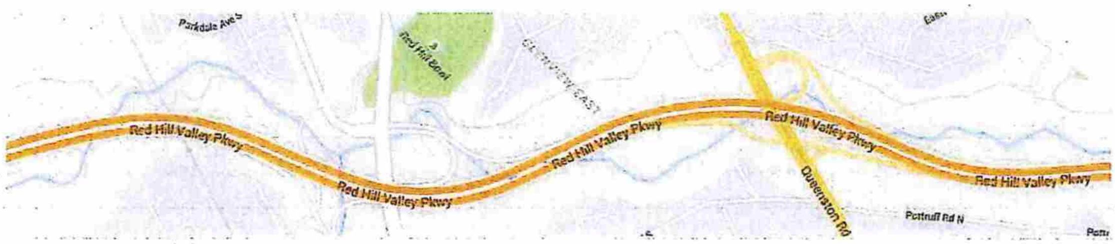

Figure 16: Critical collision locations

Median Related Collisions

- 28% of all collisions in the study area were median related, including:
  - 1 fatal collision (crossover);
  - 56 injury collisions, including 30 guiderail/concrete barrier, 17 median, and 9 crossover; and
  - 74 PDO collisions, including 41 guiderail/concrete barrier, 26 median, and 7 crossover.
- Approximately 53% of median related collisions occurred under wet surface condition.
- The most frequent apparent driver action reported in median related collisions was "lost control" (46%"), followed by "speed too fast" (18%) and "driving properly" (17%). Both "lost control" and "speed too fast" proportions are higher than for all collisions.
  - These proportions are 43% for "lost control" and 29% for "speed too fast" driver actions under wet surface conditions.

Critical Locations for Median Related Collisions

- The locations with the highest collision frequencies along the RHVP are in the vicinity of the King Street and Queenston Road interchanges, including:
  - In the northbound direction, a 600-metre section around the King Street interchange (40% of northbound collisions over 7.5% of the RHVP length); and
  - In the southbound direction, a 1,100-metre section around the King Street and Queenston Road interchanges (38% of southbound collisions over 13.5% of the RHVP length).
  - In both directions combined, a 1,400-metre section around the King Street and Queenston Road interchanges (44% of collisions over 17% of the RHVP length).
  - Most median related collisions at the above locations involved a vehicle striking a guiderail, however crossover collisions were proportionally more severe.

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- Wet surface conditions were present in 74% of median related collisions at the above locations.

Potential Contributing Factors to Collisions

The overall findings from the collision review indicate that the proportion of wet surface collisions in the study area is significantly higher than typically observed in the City and in the Province. A high proportion of wet surface condition suggests that one or more than the following conditions may be present:[9]

- Inadequate skid resistance (surface polishing, bleeding, contamination);
- Hazardous manoeuvres that may be related to avoidance manoeuvres or surface deficiencies (potholes, waves, other deformations, water accumulation); and/or
- Excessive speed.

It was also found that the prevalent apparent driver actions involved in collisions in the study area, both in general and median related, are 'lost control', 'speed too fast', and 'improper lane change'. According to the Ministry of Transportation's definition[10], the "lost control" driver action is related to unexpected circumstances such as mechanical malfunction, object on roadway, slippery road surface or losing consciousness. It would not be unreasonable, however, to suppose that other driver actions such as excessive speed or driver distraction/inattention end up being coded as loss of control, especially for SMV collisions or other collisions where the police officer completing the accident report is not able to collect accurate information from witnesses.

Another indication that high speeds may be involved is the fact that some curves within the study area (in particular the four curves in the vicinity of King Street and Queenston Road) appear to have curve radii of approximately 525 metres[11], which is the minimum per Provincial Standards for a design speed of 110 km/h and a maximum superelevation of 6%.[12] Under these circumstances, a vehicle slightly exceeding the design speed could run off the road while negotiating these curves. This section of the RHVP presents the highest concentration of collisions in the study area, with an increased proportion of wet surface collisions.

Finally, the consequences of improper lane changes tend to be aggravated at higher speeds and/or wet surface conditions, since it becomes more difficult for drivers to maintain control of the vehicle.

Further discussion regarding these conditions can be found in **Section 5**.

Conclusions

Based on the collision review, it appears that the combination of high speed and wet surface may be the primary contributing factors to collisions on the RHVP, especially in the vicinity of the interchanges of King Street and Queenston Road, where small-radius horizontal curves are present. This applies both to all collisions in the study area and to median related collisions only. The need for

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[9] Road Safety Manual, World Road Association, 2003.

[10] Accident Information System – MS Access Query User Guide, Version 1.4, Ministry of Transportation Ontario, 2004.

[11] Design information was not provided for these curves. Approximate measurements were taken from satellite imagery.

[12] Geometric Design Standards for Ontario Highways, Ministry of Transportation Ontario, 1985. Table C3-2.

a median barrier, either along the entire study area or limited to the vicinity of the interchanges of King Street and Queenston Road, will be determined based on a benefit/cost analysis.

5. Field Investigation

A field investigation was conducted on Thursday, August 30, 2015 under clear weather conditions and during peak and off-peak periods. A night-time review was also conducted to assess visibility under reduced lighting conditions. CIMA staff was accompanied by City's maintenance staff during the daytime review in order to gain a better understanding of site conditions and operations, based on their daily experience on the RHVP.

The field investigation included a review and/or analysis of:

- Conformance and consistency
  - Related to site geometrics, traffic control devices and safety devices.
- Traffic control
  - Traffic signage and pavement markings (applicability, condition, function, and conspicuity).
- Site operations and road user interactions
  - Site operations;
  - Road user operations and interactions, including human factors analysis;
  - Positive guidance; and
  - Traffic patterns and behaviour throughout the study area.
- Safety devices
  - Guiderail systems, approach/end treatments, crash cushions, post-mounted delineators etc.; and
  - Potential unprotected roadway and roadside hazards (non-existence of safety devices).
- Site conditions
  - Roadway surface, lighting, roadway safety hardware and the roadside; and
  - Physical evidence of road user collisions.

The findings of the field investigations are discussed in the following sections.

5.1 Roadside Safety Devices

The minimum required clear zone for a design speed of 110 km/h, according to the MTO's Roadside Safety Manual (Table 2.2.1) is 9.0 m for tangent road sections. The Roadside Safety Manual also provides Curve Correlation Factors (Table 2.2.2) that vary with design speed and curve radius. For a design speed of 110 km/h, these factors range between 1.00 (R = 1,000 m) and 1.44 (R = 500 m). The Curve Correlation Factor is a multiplier meaning that the minimum required clear zone at a curve section at this design speed can be as wide as 13 m (1.44 x 9.0) at certain locations.

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CIMA conducted a review of the barrier systems within the study area. The barrier systems currently employed on the RHVP include steel beam guiderail and concrete barriers, which are provided in limited areas. All overhead signs and bridge columns located in the median within the study area are protected with steel beam guide rails, and a median concrete barrier is present along a 1,100 m section from Mud Street West towards Greenhill Avenue, where the distance between the traffic lanes in opposite directions is approximately 8.5 m (i.e. less than the clear zone).

The review of collision history revealed a large number of median related collisions including one fatal collision. During the field investigation, evidence of vehicles losing control towards the median was found, including skid marks and damage to guide rails, as illustrated in **Figure 17**. With the exception of the 1,100 m section between Mud Street West and Greenhill Avenue, the median does not have a continuous barrier to protect against median cross-over collisions. The study area was further evaluated regarding the benefits and drawbacks of providing a median barrier. Findings are provided in **Section 7**.

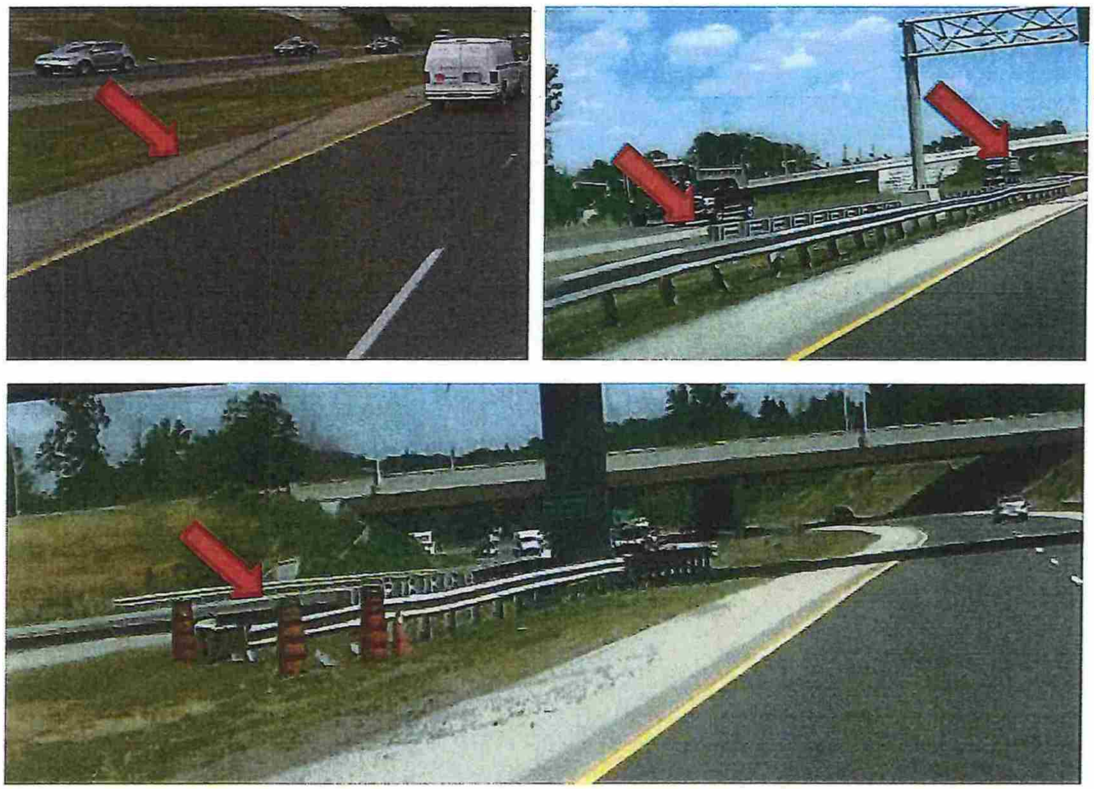

Figure 17: Evidence of loss of control towards the median / collisions with guide rails

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It was also noted that some "fishtail" leaving end treatments at some guide rails protecting bridge structures are located within the clear zone of the opposite direction of traffic (**Figure 18**). When this is the case, the guide rails at the opposite direction do not provide the required length of need to protect the end treatment (**Figure 19**). This type of end treatment can represent a spearing hazard in the event of a frontal collision and should be protected when located within the clear zone.

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Figure 18: RHVP typical guide rail leaving end treatment

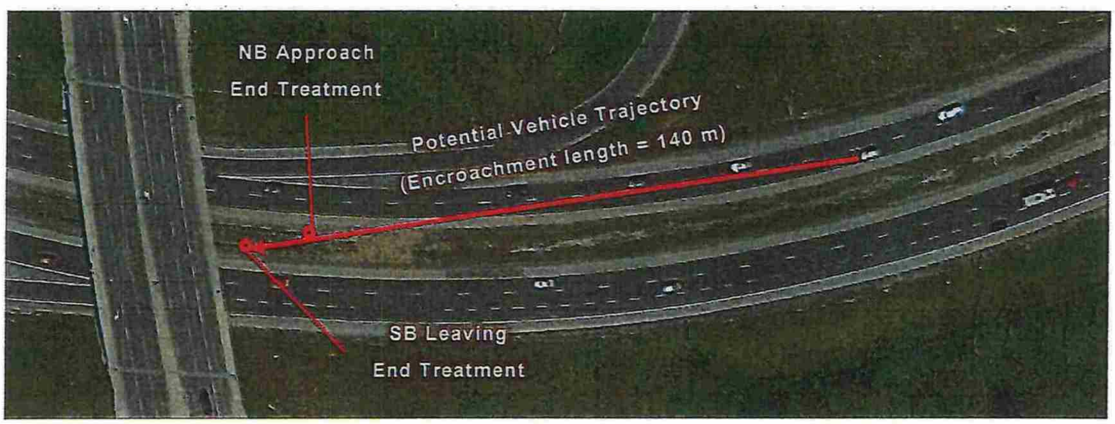

Figure 19: Potential trajectory of a vehicle towards fishtail end treatment

5.2 Traffic Operations

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During the field investigation, most drivers, during periods of uncongested traffic conditions, were observed to be driving over the speed limit of 90 km/h. CIMA reviewed the speed studies conducted for the 2013 RHVP study, particularly along the mainline section between Mud Street and Greenhill Avenue. The results of the speed studies are summarized in **Table 5**. The results show that the average speeds in each direction are in excess of the posted speed limit. The 85th percentile speed, which is typically used to represent the operating speed of a road, is the same as the assumed design speed of the RHVP for the northbound direction, and 5 km/h in excess of the assumed design speed for the southbound direction. Approximately one in six drivers exceed the design speed in the northbound direction, and approximately one in five in the southbound direction. The high speeds

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observed on the RHVP may be a contributing factor for collisions, especially SMV and/or wet pavement related collisions. An average of more than 500 vehicles per day were recorded exceeding 140 km/h.

Table 5: RHVP operating speeds

Measure	Northbound	Southbound
Average speed	95 km/h	99 km/h
85th percentile speed	110 km/h	115 km/h
Exceeding speed limit	60%	72%
At or exceeding design speed	15%	22%
Exceeding 140 km/h	> 500 per day	

Location: Mainline between Mud St. and Greenhill Ave.
Date: May 2013

Given the high operating speeds, as well as the high concentration of collisions in the vicinity of the King Street and Queenston Road interchanges, where a sequence of curves of relatively small radii is present[13], a ball bank indicator study was conducted to gain additional understanding of the potential collision contributing factors. Ball bank indicator studies are typically utilized to determine curve advisory speeds. The test provides a combined measure of centrifugal force, vehicle roll and superelevation of the road by measuring the angle of the ball bank indicator while travelling through a curve at a given speed. The study was conducted on Tuesday September 1st, 2015, at travel speeds of 90, 100, and 110 km/h along the left lane (i.e. the lane closest to the median) of the RHVP in each direction. Because the testing required exceeding the speed limit of the road, the study was conducted in a Hamilton Police Service cruiser driven by a police officer to ensure safety of staff and general public. **Table 6** provides a summary of the ball bank indicator study, for each direction and travel speed, compared to thresholds available in the Traffic Engineering Handbook.[14]

Table 6: Ball bank indicator thresholds and test results

Travel Speed	Threshold [14]	Test Speed (km/h)	Maximum Reading NB	Maximum Reading SB
≥ 30 mph (48 km/h)	12	110	12.2	10.5
		100	10.8	9.0
		90	9.4	7.1
20-25 (32-40 km/h)	14	Not tested		
≤ 20 (32 km/h)	16			

The results of the ball bank study indicate that a travel speed of 90 km/h, which is equal to the posted speed limit, is well below the maximum threshold of the ball bank indicator. As the test speed increases, the readings also increase, slightly exceeding the threshold in the northbound direction at 110 km/h. This reading was recorded at the King Street interchange. It should be noted that the

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[13] Curve radii near the King Street and Queenston Road interchanges are approximately 525 m, which corresponds to the minimum for a design speed of 110 km/h (Geometric Design Standards for Ontario Highways, Table C3-2)
[14] ITE Traffic Engineering Handbook (6th Edition). Table 11-2.

thresholds provided in the Traffic Engineering Handbook are based on driver comfort, not safety. However, the circumstances under which the test was conducted are likely safer than the ones under which collisions are occurring, including:

- The test was conducted under dry surface conditions, while most collisions reported in this area occurred under wet surface conditions;
- The test was conducted with a Police Cruiser (2011 Ford Crown Victoria, Police Package), which may have a more stable suspension and may result in readings lower than the average passenger car; and
- The test was not conducted at speeds higher than 110 km/h. As shown in **Table 6**, at least 15% of drivers exceed this speed.

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The RHVP is mostly used by commuter traffic, meaning drivers are expected to be familiar with the road. During the field investigation, it was noted that, occasionally, drivers entering the RHVP from an on-ramp tend to do so in a somewhat aggressive fashion, merging onto the mainline as soon as they reach the dashed line at the acceleration lane. This may be due to a potential perception by drivers that some acceleration lanes along the RHVP are too short (especially considering the high operating speeds as shown in **Section 5.2.1**), and may contribute to sideswipe and SMV collisions (as drivers on the mainline swerve to avoid a sideswipe collision with a merging vehicle). Additionally, some on-ramps in the study area present relatively high vegetation that may restrict visibility, to drivers on the mainline, of approaching vehicles from the ramps (**Figure 20**), which has the potential to violate drivers' expectancy related to merging traffic.

Section 5.4.3 discusses the application of MERGE warning signs on the RHVP, used to alert drivers of unfavorable merging conditions.

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Figure 20: Vegetation obscuring view of vehicles approaching from on-ramp

5.3 Pavement Surface

The high proportion of wet surface related collisions observed in the study area may indicate a potential issue with pavement skid resistance. According to City staff, Stone Mastic Asphalt (SMA) was utilized in the RHVP. SMA pavements, originally developed in Germany, are designed to provide better resistance to permanent deformation, wearing, cracking due to cold or mechanical stress[15], as well as to provide reduced noise levels due to its negative surface texture reducing vibrations in the tire and connected air paths reducing 'air pumping' noise.[16]

One industry identified characteristic of SMA pavements is that skid resistance is lower by approximately 30 to 40% (under dry conditions) in newer surfaces, reaching normal levels after 6 to 18 months, depending on local conditions and traffic levels.[16] However, as shown in **Figure 21**, the proportion of wet surface collisions seems to be increasing over the years.[17] This suggests that, if low skid resistance is a contributing factor, it is not necessarily related to the normal early life properties of SMA pavements.

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15 Stone Mastic Asphalt Guide, German Asphalt Association. Bonn, Germany (2000). English Translation: 2005.

16 Greer, G. Stone Mastic Asphalt – A review of its noise reducing and early life skid resistance properties. Proceedings of ACOUSTICS 2006. Christchurch, New Zealand (2006).

17 The significant drop in wet surface collisions in 2015 is not conclusive since the data analysis only included collision records between January and July. Wet surface collisions are expected to be lower in the winter period since snow, ice and slush conditions are more frequent than wet surface.

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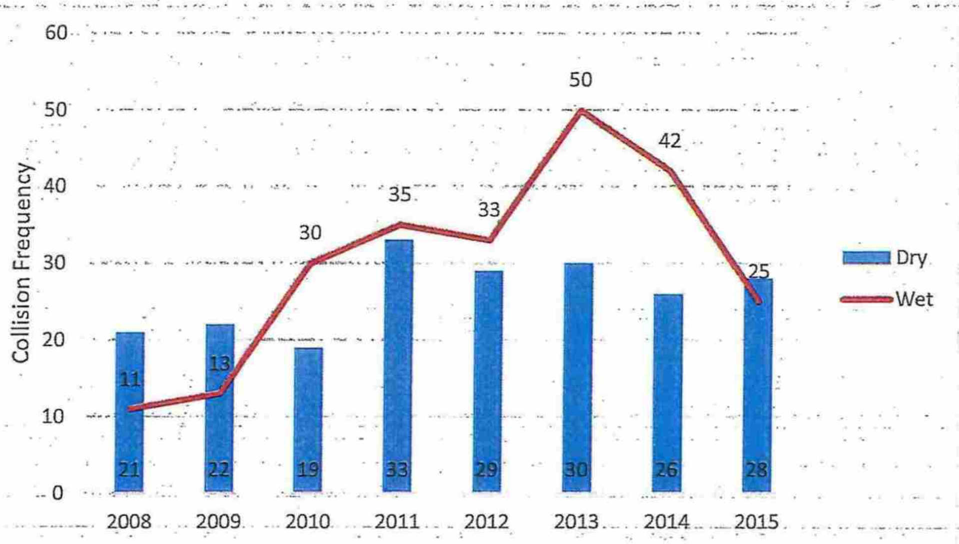

Figure 21: Temporal trend: wet surface collisions

Another potential contributing factor for wet pavement collisions are the high speeds observed on the RHVP. As discussed in **Section 5.2.1**, operating speeds are generally equal to or higher than the design speed of the road. This is reinforced by the high concentration of SMV collisions near horizontal curves.

5.4 Signage

CIMA reviewed signage on approach to and within the study area. Signage was checked for conformity to appropriate OTM Books, for application, size and approximate placement. Our review of the study area revealed the following findings.

5.4.1 'Slippery When Wet' Signs

OTM Book 6 (Warning Signs) states that SLIPPERY WHEN WET signs (Wc-5) should be used:

- At locations where field investigations determine that a pavement has a significantly reduced wet weather skid resistance;
- Where for no other identifiable reason more than one third of all collisions on a given section of highway are occurring on wet pavement;
- At locations which consistently have an abnormally high number of wet weather conflicts or collisions; or
- For other reasons related to wet pavement hazards, under approval from the local Road Authority.

OTM Book 6 also indicates the options to install SLIPPERY WHEN WET tab signs (Wc-5t), to increase motorist familiarity with the symbol, or ADVISORY SPEED tab signs (Wa-7t), to indicate the safe speed for driving along a section of road in conjunction with the Wc-5 sign.

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Given the existing proportion of wet pavement collisions (50%), oversize SLIPPERY WHEN WET signs (Wc-105) should be used in the study area. Four of these signs are installed along the RHVP, however they are placed immediately in advance of two bridges (one between Mud Street and Greenhill Avenue, and one between Barton Street and the north end of the study area) and combined with BRIDGE ICES tab signs (**Figure 22**). This tab sign is not part of the current version of OTM Book 6, although it will be included in the updated version, expected to be published in 2015. However, this tab will be recommended for use with the new BRIDGE/ROAD ICES sign, which will have the same design as the WC-23 "Bridge Ices" sign from the Manual of Uniform Traffic Control Devices for Canada (MUTCDC). **Figure 23** illustrates the two different signs.

Figure 22: SLIPPERY WHEN WET sign + BRIDGE ICES tab sign

Figure 23: SLIPPERY WHEN WET sign (left) and BRISGE/ROAD ICES sign (right)

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Because these two signs are intended to convey different messages, the use of the SLIPPERY WHEN WET sign to represent both "slippery when wet" and "bridge ices" conditions is not recommended, as this may create confusion for drivers (although the tab helps clarify the different conditions). This is especially important on the RHVP, since both conditions are possible and should be signed accordingly.

5.4.2 Object Marker Signs – Various Locations

Several guide rail approach end treatments were found to have missing, damaged, or obscured OBJECT MARKER signs (Wa-33). **Table 7** provides a list of all identified locations, and **Figure 24** illustrates these three conditions.

Table 7: Missing object marker signs at guide rail approach end treatments

Direction	Location	Side	Issue
EB	Upstream of Dartnall interchange	Left	Obscured by vegetation
EB	Upstream of Stone Church/Mud interchange	Left	Obscured by vegetation
NB	Underneath Mud overpass	Left	Obscured by vegetation
NB	Downstream of Mud interchange	Left	Obscured by vegetation
NB	Downstream of Mud interchange	Right	Missing
NB	Underneath Greenhill overpass	Left	Damaged
NB	Downstream of Greenhill interchange	Left	Missing
NB	Underneath railway overpass btwn Greenhill and King	Left	Damaged
SB	Downstream of Barton interchange	Left	Missing
SB	Underneath Mud overpass	Left	Obscured by vegetation
SB	Underneath Pritchard overpass	Left	Damaged / Obscured by vegetation
SB	Downstream of Pritchard overpass	Left	Missing

Figure 24: Examples of Missing, Damaged and Obscured Object Marker Signs

5.4.3 'Merge' Signs

According to OTM Book 6, MERGE signs (Wa-16) alert drivers that vehicles from the other roadway (acceleration lanes from ramps entering a freeway being an example) may soon be entering the lane in which they are travelling, and that they must exert caution and adjust their positioning to accommodate the ingress of vehicles. They are also used to provide warning to traffic entering the roadway that they do not have the right of way and must prepare to merge with through traffic. Some interchanges in the study area have MERGE signs warning about the acceleration lane, while some do not.

OTM Book 6 indicates that a MERGE sign should be used:

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- Where the merging traffic conditions are unexpected, out of the road user's view, or otherwise not obvious to the road user; and
- Where the length of an acceleration lane and/or taper is within the range of values specified in [*OTM Book 6 Table 9*].[18]

The RHVP presents some unexpected merging traffic conditions, including some on-ramps and acceleration lanes within horizontal curves and aggressive merging behaviour, as discussed in **Section 5.2.2. Table 8** indicates the locations where MERGE signs are present/not present, as well as requirement for the sign based on length of acceleration lane and/or taper.

Table 8: MERGE sign presence and requirements on the RHVP

Direction	Ramp	Merging Condition	Accel.+Taper	Present	Required
EB	Dartnall S-E	On-ramp located within horizontal curve	293+58 m	Yes	No
NB	Mud E-N	On-ramp located within horizontal curve	443+62 m	Yes	No
NB	Greenhill E-N	Weaving area	n/a	No	No
NB	King E/W-N	Weaving area; vehicles on ramp may become obscured by vegetation	n/a	No	No
NB	Queenston E/W-N	On-ramp located within horizontal curve	150+85 m	No	Yes
NB	Barton E/W-N	No concerns	145+65 m	Yes	Yes
SB	Barton E/W-S	Vehicles on ramp partially obscured by vegetation	165+77 m	No	Yes
SB	Queenston E/W-S	Weaving area within horizontal curve	n/a	Yes	No
SB	King E/W-S	Vehicles on ramp significantly obscured by vegetation	173+60 m	Yes	Yes
SB	Greenhill E-N	Acceleration lane becomes through lane	n/a	No	No
SB	Mud E-S	On-ramp located within horizontal curve	130+85 m	Yes	Yes
SB	Dartnall S-W	On-ramp located within horizontal curve, however acceleration lane on tangent	202+72 m	Yes	No

5.5 Pavement Markings and Delineation

Pavement markings within the study area were generally found to be in good condition at the time of the review and no issues were identified during daytime.

During night time, however, the absence of illumination makes it difficult for drivers to see the pavement markings ahead of the vehicle. The lane lines become visible for a longer distance south of Greenhill Avenue, where Permanent Raised Pavement Markers (PRPM) are installed. The PRPMs were recommended by CIMA in the 2013 RHVP Safety Review and seem to have improved visibility of lane lines. However, the edge lines remain difficult to see. **Figure 25** through **Figure 27**

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[18] For a posted speed limit of 90 km/h, minimum and maximum lengths of acceleration lane and/or taper for the use of a MERGE sign are, respectively, 80 and 200 m. Where the length of acceleration lane and/or taper is less than the minimum or greater than the maximum lengths specified, MERGE signs must not be used.

illustrate pavement marking visibility under different conditions, including daytime, nighttime without PRPMs, and nighttime with PRPMs.

It was also observed that, where present, guide rails or concrete barriers on the median are not visible due to the lack of delineation along these devices.

Figure 25: Pavement markings during daytime condition

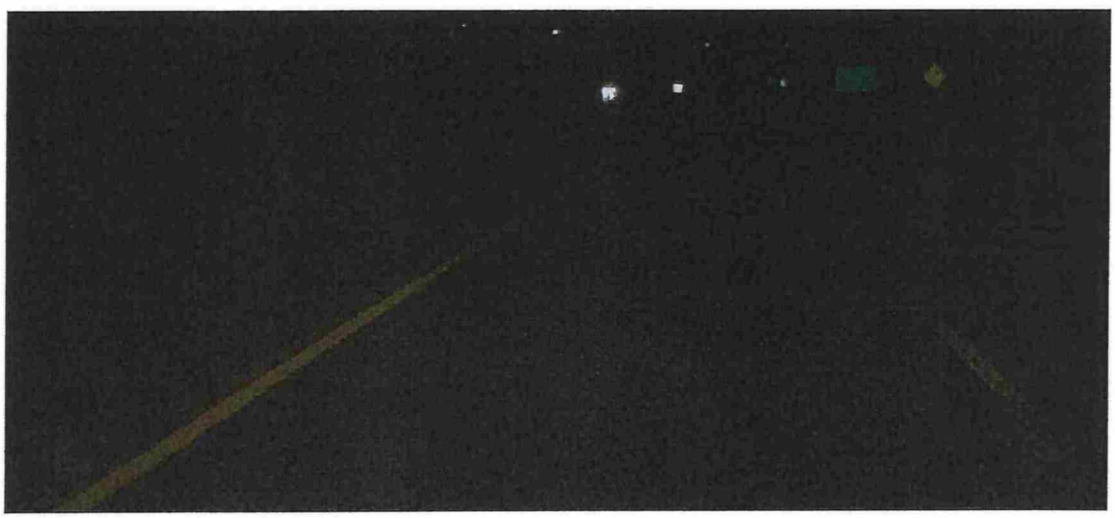

Figure 26: Pavement markings during nighttime condition (without PRPMs)

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Figure 27: Pavement markings during nighttime condition (with PRPMs)

6. Illumination Review

The primary objective of illumination is to increase safety by providing drivers with improved nighttime visibility of roadway conditions and potential hazards. Although nighttime collision proportions were not found to be significantly higher than provincial or municipal averages, the review of the need for illumination was part of the scope of this study, as requested by the City.

It should be noted that design choices that were made during the design phase were intimately linked to approvals. Reference materials note that, *"The sole reason for making design changes was to reduce environmental impacts."*[19] The Valley section of the Parkway traverses the Niagara Escarpment, a UNESCO World Biosphere Reserve, designated for its unique landform characteristics and the presence of a provincial land use plan to guide development in its area. Because of this unique area, and because of the costs associated with building a roadway on the escarpment, the City identified several design refinements that included restricting illumination to intersections and on/off ramps.[20]

In order to determine whether additional illumination should be considered for installation within the study area, the Transportation Association of Canada (TAC) Roadway Lighting Guide was used, as well as the Ministry of Transportation Ontario (MTO) Policy for Highway Illumination. These policies are based on an analytical approach where several factors have been incorporated. The determination of the need for illumination is performed through the use of warrants which consider road geometry, operations, environmental, and collision factors. For each factor, a rating between 1 and 5 is assigned depending on the conditions encountered. The higher the rating, the greater the hazard and the more critical is the need for illumination. A weight is also attributed to each factor,

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[19] Red Hill Valley Impact and Design Process, City of Hamilton, Page 3
[20] Red Hill Valley Project Public Consultation Report, March 2003, Lura Consulting, Page 136

indicating its relative importance. When factors vary within the portion of roadway for which the warrant is being undertaken, the worst case rating is recommended for the entire segment.

The warrant forms used to determine the need for illumination in the sections of the RHVP between the Lincoln Alexander Parkway and Greenhill Avenue, and between Greenhill Avenue and the Queen Elizabeth Way, are provided in **Appendix B**. This segmentation was chosen for the following reasons: it is approximately the midpoint of the study area, as well as the study limit for the study conducted in 2013; and some notable changes in characteristics occur, including the beginning of a third lane in the southbound direction just south of Greenhill, the presence of a grade between Mud Street and Greenhill Avenue, and generally smaller curve radii in the vicinity of King Street and Queenston Road (north of Greenhill Avenue).

The results of the illumination warrant analysis are summarized in **Table 9.**

Table 9: Illumination Warrant Analysis Results

Section	Warranting Condition	Result	Warranted
Lincoln Alexander Parkway to Greenhill Avenue	TAC: 60 MTO: 80	TAC: 57 MTO: 117	Yes
Greenhill Avenue to Queen Elizabeth Way		TAC: 61 MTO: 117	Yes

Legend: (TAC) MTO

According to both TAC and MTO policies, illumination is warranted on the RHVP. However, the MTO warrant provides additional criteria based on the Benefit/Cost ratio of providing illumination. Warranting thresholds are summarized in **Table 10**.

Table 10: MTO Benefit/Cost Warranting Thresholds

Benefit/Cost Ratio	Warrant	
Greater than 2.0	Lighting is warranted	
Greater than 1.0	Lighting is optional	Lighting is warranted
Equal or less than 1.0	Lighting is not warranted	Lighting is optional
Percentage points from the Forms	50%	100%

The resulting percentage points from the MTO warrant is 146% for both sections north and south of Greenhill Avenue. In this case, illumination will be warranted if the Benefit/Cost ratio of providing it is greater than 1.0, and optional if otherwise. The Benefit/Cost of providing illumination will be discussed in **Section 7.1.3.**

Other factors, however, should be taken into account in the decision to provide illumination along the RHVP mainline, including the context of the surrounding roadway network. For example, while illumination may improve visibility at night, it may also create the situation where drivers' eyes must adjust back to darkness when leaving the illumination portion of the roadway. Currently, the Lincoln Alexander Parkway present only partial interchange illumination, and, considering the approval conditions previously mentioned, installing illumination could create a situation where drivers enter a short illuminated section, followed by a non-illuminated section, and finally back to an illuminated

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section. Another consideration is roadside safety. Luminaires must be installed in safe locations that recognize their potential hazard to vehicles. The location and placement of luminaires must also take into account the need for maintenance, meaning they must be accessible to workers.

7. Determination of Potential Countermeasures

This section summarizes potential countermeasures for the study area based on our findings of collision analysis and field investigation. The results of the collision analysis identified:

- A high proportion of wet surface collisions highly concentrated in the vicinity of the King Street and Queenston Road interchanges, where horizontal curves are present; with high speeds suspected to be a major contributing factor; and
- Median related collisions under the same conditions described above.

Based on these results, the following sections provide potential countermeasures for the study area. Potential countermeasures are provided in two parts. The first part covers potential countermeasures that are generally intended to reduce number of collisions. The second part covers mitigation measures that are expected to reduce severity of collisions.

7.1 Potential Countermeasures for Reduction of Overall Collisions

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The findings from the collision review indicate that excessive speeds are likely a major contributing factor to collisions in the study area. Targeted police enforcement of areas with known high collision frequency can be an effective means to reduce speeds and, by consequence, collisions. There is no CMF for this countermeasure, and costs are expected to be included in regular police activities. However, there is a possibility that this measure is not operationally feasible due to a lack of safe locations to park patrol vehicles near the high-collision areas. This countermeasure should be discussed with Hamilton Police Service.

Changeable speed feedback signs for individual drivers are intended to influence driver behaviour and reduce excessive speeds. The signs consist of boards connected to speed measuring devices that display text such as "Your speed is XX km/h" or "You are driving too fast". This countermeasure should be implemented in conjunction with speed enforcement, for two main reasons; first, it would provide individual feedback to most drivers 24 hours per day, 7 days per week, which police enforcement cannot achieve; and second, compliance with speed limit as a result of speed feedback signs alone may be reduced over time if drivers do not perceive that speeds are being enforced (especially considering the commuter nature of the RHVP).

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The CMF for this countermeasure is 0.54 with an adjusted standard error of 0.17[21] (meaning it can range from 0.2 to 0.88 with a 95% confidence interval), and the construction cost is $12,500 per site for a service life of 10 years.

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Oversized speed limit signs (90x120 cm) provide improved visibility and impact on drivers. Larger speed limit signs are reported to be more effective when used with increased police enforcement.[22]

There is no CMF available for this countermeasure, and installation costs is $500 per sign.

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1 2 1 er orm Fr o e

Pavement friction plays a vital role in keeping vehicles on the road by enabling the drivers to control/manoeuver the vehicle in a safe manner (in both the longitudinal and lateral directions). Several methods and devices are available for measuring pavement frictional characteristics. Pavement surface texture is influenced by many factors, including aggregate type and size, mixture proportions, and texture orientation and details. Texture is defined by two levels: microtexture and macrotexture. Currently, there are no direct means for measuring microtexture in the field. However because microtexture is related to low slip speed friction, it can be estimated using a surrogate device. Macrotexture is characterized by the mean texture depth and the mean profile depth; several types of equipment are available for measuring these indices.

Because of the high proportion of wet surface condition and SMV collisions, the City could consider undertaking pavement friction testing on the asphalt to get a baseline friction coefficient for which to compare to design specifications. It is important to perform the tests under normal conditions as well as under typical wet pavement conditions encountered on the RHVP in order to simulate, as best as possible, the conditions under which collisions occur. For example, if more water accumulates on the pavement under typical conditions than under normal testing conditions, the tests may result satisfactory, when in reality friction may be reduced. Tests should also be performed near locations with the highest frequencies of wet surface collisions, especially curves.

The estimated costs to undertake these are approximately $40,000. Based on the results, the City may be in a better position to determine if further action is required.

1 I m o

The primary objective of illumination is to increase safety by providing drivers with improved nighttime visibility of roadway conditions and potential hazards. As discussed in **Section 6**, continuous illumination along the RHVP is either warranted or optional, although restrictions from the

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[21] http://www.cmfclearinghouse.org/detail.cfm?facid=78
[22] Handbook of Speed Management Techniques. Texas Transportation Institute. September, 1998.

approvals phase may result in an undesired condition where illuminated and non-illuminated sections alternate, forcing drivers' eyes to adjust between light and darkness.

The CMF for this countermeasure is 0.97[23], and expected construction costs are $100,000 / centreline km over a 20-year service life.

1 d e e o

1 1 er e e d Br d e l e

The purpose for the 'Slippery When Wet' sign is to advise drivers that the surface of the roadway has a significantly reduced wet weather skid resistance. Competent drivers are aware that the friction of the road surface is reduced in wet weather; therefore this sign is reserved for use where the skid resistance of the road is reduced to an unexpectedly low level. OTM Book 6 guidelines indicate that these signs should be installed at locations where field investigations determine that the pavement has a significantly reduced wet weather skid resistance, or where for no identifiable reason more than one third of all collisions on a given section of road are occurring on wet pavement (among other criteria). As found during the collision review, more than half of all collisions are occurring on wet pavement, and approximately 70 to 80% of all collisions in the vicinity of the King Street and Queenston Road interchanges involve wet surface conditions. The City should consider installing Wc-105 SLIPPERY WHEN WET signs, combined with Wc-5t SLIPPERY WHEN WET tab sign along the study area, in intervals of 1 km or less (in accordance with OTM Book 6 guidelines for urban areas). Additionally, the City should replace the existing Wc-105 signs located at the two bridges (refer to **Section 5.4.1**) with WC-23 BRIDGE/ROAD ICES signs.

There is no specific CMF for the installation of 'Slippery When Wet' signs. Installation cost is $500 per sign resulting in a total cost of $8,000. If the City would like to place additional emphasis on the area near the King Street and Queenston Road interchanges, consideration may be given to installing rain activated flashing beacons on the 'Slippery When Wet' signs within this section. This would raise installation costs to approximately $128,000 (considering 4 solar powered flashing beacons), however it is expected to draw driver's attention and increase their awareness about the wet surface conditions in the critical area.

Another alternative is to display messages related to road and environment conditions using Dynamic Message Signs (DMS) that can be implemented as part of the City's planned Advanced Traffic Management System (ATMS) project, consisting of an Intelligent Transportation System (ITS) Freeway Traffic Management System (FTMS) inclusive of the entire Linc and RHVP freeway system from Hwy 403 to the QEW. **Figure 28** provides examples of DMSs used on Ontario Highways under MTO's jurisdiction.[24]

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[23] MTO Safety Analyst tool

[24] http://www.mto.gov.on.ca/english/traveller/trip/compass-ftms.shtml#vms

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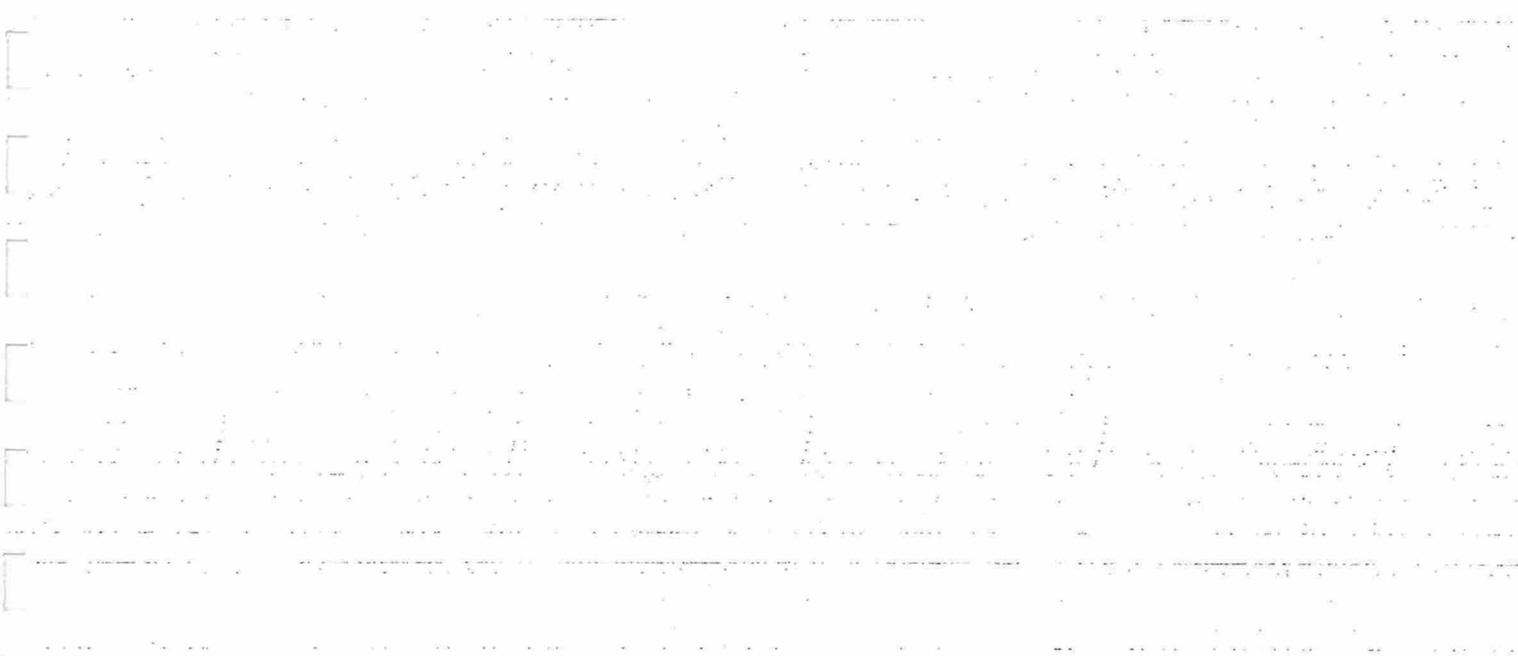

Figure 28: Examples of Dynamic Message Signs

7.1.4.2 'Merge' Signs and Vegetation at On-Ramps/Merging Areas

As highlighted in **Section 5.4.3**, two RHVP on-ramps require the use of MERGE warning signs (Wa-16), however they are not present at these locations. The City should consider installing these signs at the Queenston Road E/W-N and Barton Street E/W-S on-ramps to increase driver awareness of the possibility of merging vehicles and potentially reduce evasive manoeuvres that can lead to SMV and sideswipe collisions.

Some locations were identified to have MERGE signs installed, even though not required by OTM Book 6. However, the City may opt not to remove these signs, given the overall geometry of the RHVP and its merging areas, as well as the presence of vegetation between some on-ramps and the adjacent mainline, merging traffic conditions may not be obvious to some drivers.

Finally, as discussed in Section **5.2.2**, some on-ramps present vegetation that may restrict the ability for drivers on the mainline to see vehicles approaching from the ramp. The City should consider trimming the vegetation in these areas low enough so approaching vehicles are visible.

The estimated cost to install the two 'Merge' signs is $1,000; vegetation trimming is expected to be undertaken as part of regular maintenance activities, therefore no additional cost is associated.

7.1.4.3 Permanent Recessed Pavement Markers (PRPMs)

PRPMs are delineation devices that are often used to improve preview distances and guidance for drivers in inclement weather and low-light conditions. Given the wet surface and rainy weather trend in collisions along the RHVP, combined with the curvilinear geometry of the roadway, PRPMs have the potential to positively affect the collision experience on the roadway as well as increase driver security. This countermeasure had been recommended in the previous study, conducted in 2013, and was implemented in the southern section of the study area. Installing PRPMs in the northern section would also provide consistency throughout the entire length of the RHVP and improve night-time visibility for drivers, since no illumination is present.

The CMF for this countermeasure is 0.67 for nighttime collisions[25], and the estimated installation cost is $20,000 per kilometre.[26]

7.2 Potential Countermeasures for Mitigating Median Related Collisions

7.2.1 Median Barrier

7.2.1.1 Evaluation of the Benefits and Drawbacks of Providing a Median Barrier

Median barriers are very effective in preventing median crossover collisions, which are generally fatal or high severity collisions. Median barriers do not eliminate the collisions. However, they are very effective in mitigating outcomes of collisions by reducing severity of collisions. Median barriers generally result in an increase in overall collisions, which are generally PDO. Therefore, these barriers should be evaluated for the potential benefit as compared to drawbacks.

The collision review revealed that median crossover collisions correspond to 13% of all median related collisions in the study area, including 1 fatal, 9 injury, and 7 PDO collisions within 7.5 years (2008 to July-2015), amounting to a societal cost of approximately $ 2.17 M based on current MTO's societal costs.[27]

The benefits and drawbacks of providing a median barrier along the entire section of the RHVP within the study area were evaluated. The prevailing guidance in Ontario with respect to roadside barriers is the MTO Roadside Safety Manual (RSM). The RSM provides a median barrier warrant guide for divided highways, shown in **Figure 29**. The assessment is based on median width, (measured between edges of driving lanes) and predicted 10 years traffic volume (AADT).[28]

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[25] NCHRP Report 518 – Safety Evaluation of Permanent Raised Pavement Markers. Transportation Research Board. 2004.
[26] MTO SafetyAnalyst tool.
[27] Societal cost of a fatal collision is $1,582,000, an injury collision is $59,000 and a PDO collision is $8,000
[28] MTO's Roadside Safety Manual, Figure 2.10.1

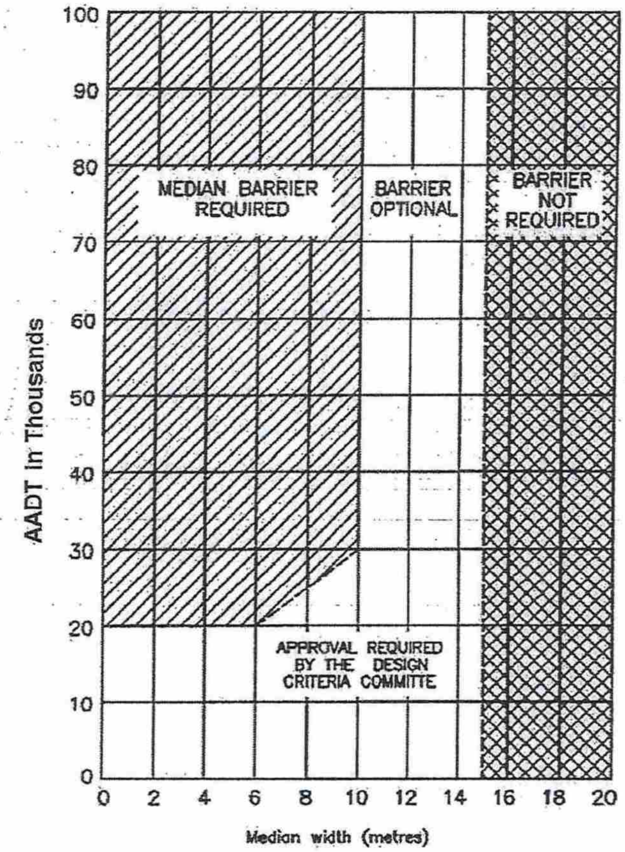

Figure 29: Median Barrier Warrant Guide for Divided Highways

According to the figure, median barriers are only warranted for highways with AADTs of 20,000 and higher and median widths less than 10.0 metres. For median widths between 10.0 metres and 15.0 metres, median barriers are optional and for median widths greater than 15.0 metres, median barriers are deemed "not required".

The guidance indicates that, within the optional range, the barriers should be only installed in special circumstances such as for highways with identified median crossover collision problem, where an identified geometric deficiency cannot be readily corrected, or for continuity with adjacent sections.[29]

The TAC Geometric Design Guide for Canadian Roadways (TAC) also provides a similar median barrier warrant guide. It also suggests conducting benefit-cost analysis for implementing median barriers.

CIMA conducted warrants for implementing median barriers within the study area by utilizing the MTO's median warrant guide demonstrated in **Figure 29** and utilizing the following data:

- AADT – 59,123 based on year 2011;

[29] Roadside Safety Manual, Section 2.10.1

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- Median Width – 15.0 m to 22.7 m (measured using aerial photography); and
- The history of median cross-over collisions.

Based on the AADT and the median width, the RHVP is in the area "not required". However, based on a history of median crossover collisions, the study area should be considered for providing a median barrier. TAC suggests conducting a benefit-cost analysis to the median barrier problem.[30]

CIMA conducted a detailed analysis to determine various feasible types of median barrier systems for the study area and also performed a cost-benefit analysis to select the best alternative for the study area.

The selection of best type of median barrier system within the study area was undertaken in the following steps:

- Determination of feasible barrier types for the study area;
- Development of alternatives; and
- Selection of the best alternative based on cost-effective analysis.

7.2.1.2 Determination of Feasibility of Barrier Types for the Study Area

CIMA conducted an analysis of various types of prevailing median barrier technologies in Canada based on MTO's Roadside Safety Manual and AASHTO Roadside Design Guide to determine feasible barrier types for the RHVP. The results of the analysis along with the characteristics of each barrier type that makes it suitable or unsuitable for the RHVP are included in **Table 11**.

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[30] TAC Geometric Design Guide for Canadian Roadways, Section 3.1.6.3

Table 11: Analysis for the Feasibility of Various Barrier Systems for the Linc

Type of Median Barrier	Relevant Characteristics	Feasibility for the RHVP
6 Cable (Wood Post)	• Not approved for use on high speed facilities	Not feasible for the RHVP due to high speed
6 Cable (Steel Post)	• Recommended for AADT < 20,000 • Ideal for median width greater than 9 m	Not feasible for the RHVP due to high AADT
Median Box Beam Barrier	• Restricted to facilities with posted speeds less than 80 km/h • Recommended for AADT < 30,000	Not feasible for the RHVP due to high AADT and speed
Median Steel Beam Guide Rail with Channel	• Recommended for AADT > 20,000 • Can be installed in medians greater than 9.0 m	Feasible for the RHVP
Standard Concrete Barrier and Ontario "Tall Wall"	• No curbs, gutters or ditches allowed between the barrier and the driving lanes • Area directly in front of barrier must be paved • Should not be located more than 4.0 metres from the edge of the driving lane (maximum width of median to be 9.0 metres)	Not feasible for the RHVP due to a median width larger than 9.0 metres
High-Tension Cable Barrier*	• 2011 AADT range – 25,820 to 46, 200 • Posted Speed – 110 km/h	Feasible for the RHVP

*Based on Successful Alberta experience in addressing cross median collisions by using the High-Tension Cable Barrier system on Highway 2 between Airdrie and Red Deer

As can be seen in **Table 11**, Median Steel Beam Guide Rail, and High-Tension Cable Barriers are feasible options for providing a median barrier for the RHVP. It should be noted that all kinds of barrier systems can be transitioned from one type to another by using standard methods. The guidance is available in MTO's Roadside Manual and AASHTO Roadside Design Guide. The appropriate types of transitions should be determined at the detailed design stage.

Based on the feasible barrier options detailed above, various alternatives available for providing a median barrier on the RHVP are as follows:

Alternative 1: Standard Steel Beam Guide Rail with Channel System on Both Sides of the Median

Provide Standard Steel Beam Guide Rail with Channel systems on both sides of the median. It should be noted that for medians, steel beam guide rails are provided with channel elements to increase the stiffness of the installation[31]. An example Standard Steel Beam Guide Rail with Channel System installed on a median on Highway 403 is demonstrated in Figure 30.

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[31] Section 4.3.5, MTO's Roadside Safety Manual

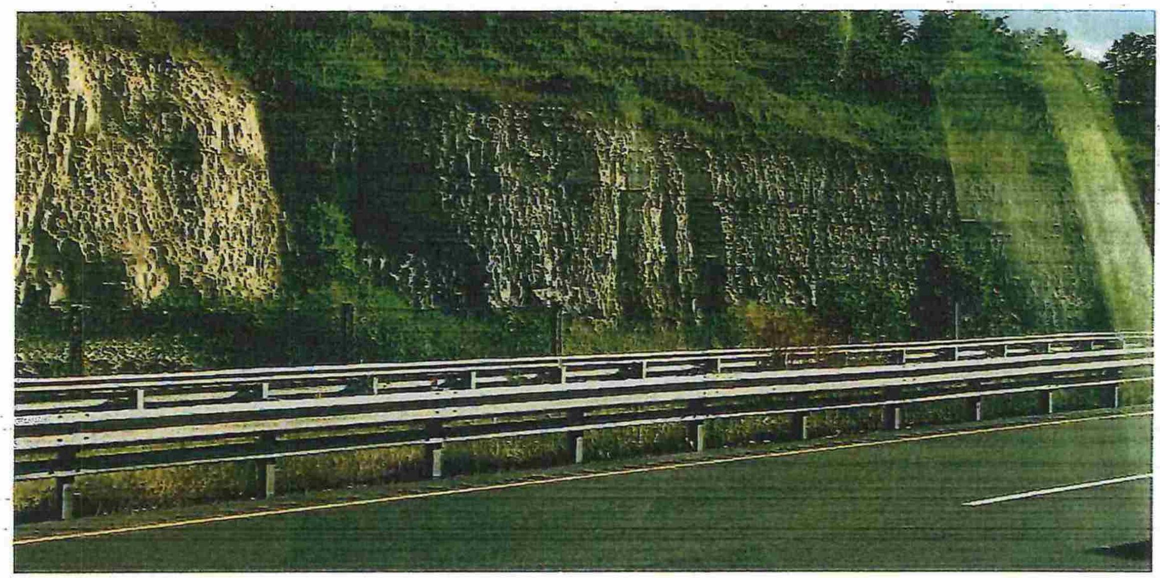

Figure 30: Example of standard steel beam guide rail with channel

Alternative 2: High Tension Cable Barrier on Both Sides of the Median

Provide High-Tension Cable Barrier on both sides of the median. An example of High Tension Cable Barrier installed on both sides of a median location on Highway 2 in Alberta is demonstrated in Figure 31.

Figure 31: Example of high tension cable barrier

Estimated costs for these alternatives are provided in **Appendix C.**

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As highlighted in **Section 5.1**, "fishtail" leaving end treatments at some guide rails protecting bridge structures are located within the clear zone of the opposite direction of traffic, and the approaching end treatment in the opposite direction does not provide the required length of need, exposing vehicle occupants to a spearing hazard. The City should consider replacing the existing extruder and "fishtail" end treatments with CAT-350 attenuators at bridge structures, which is the recommended end treatment according to the RSM. The City may also choose similar options such as the SMART crash cushion (OPSD 923.483). The estimated cost is $7,000 per unit.

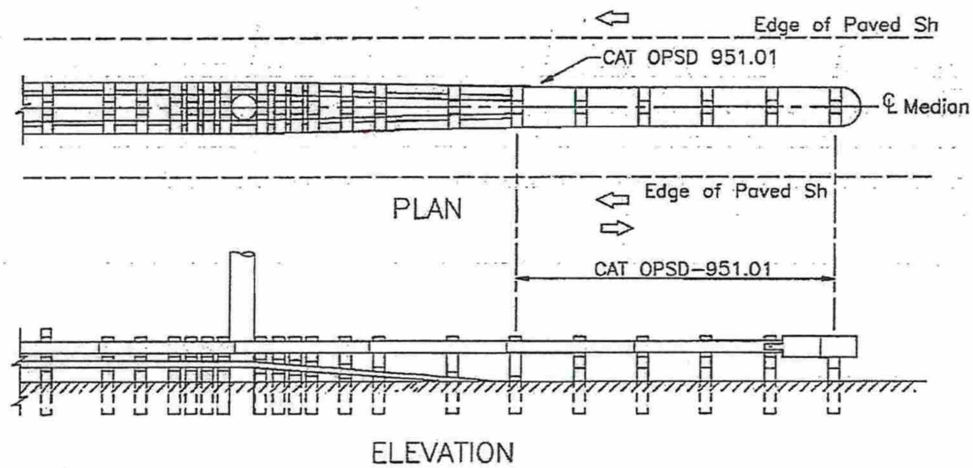

Figure 32: Steel beam protection of structures located on the median[32]

Additionally, as identified in **Section 5.4.2**, **Table 7**, several guide rail approach end treatments were found to have missing, damaged, or obscured OBJECT MARKER signs (Wa-33). These signs should be installed, replaced, or made visible by trimming the vegetation, respectively. The estimated cost is approximately $500 per sign.

8. Benefit-Cost Analysis

In order to assist in determining the effectiveness of a countermeasure, collision modification factors (CMFs) were utilized where available. CMFs were examined from a number of sources including the HSM, the FHWA CMF Clearinghouse[33]. The CMF of a countermeasure can assist in determining safety benefits of the countermeasure over the analysis period by calculating the expected number of collisions reduced.

The Benefit-Cost (B/C) ratio is the ratio of the present value of the safety benefit of a given countermeasure calculated for its service life to the present value of the cost of the countermeasure. A B/C ratio of greater than 1.0 represents an economically efficient countermeasure. In this criterion,

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[32] MTO's Roadside Safety Manual, Figure 2.8.6. OPSD number displayed in the Figure is outdated. Current applicable version is OPSD 922.330.
[33] http://www.cmfclearinghouse.org/

the monetary value of the collisions reduced as a result of implementation of a countermeasure is considered as the benefit of the countermeasure. For the purposes of calculating the societal costs of collisions, MTO costs were utilized. The benefit-cost analysis is detailed in the following sections.

8.1 Median Barrier

The benefit-cost analysis of median barriers was conducted in two steps. In the first step the analysis was conducted to compare different alternatives to select the possible alternative. In the second step, the analysis was conducted to obtain the overall B/C of the preferred alternative.

In order to select the best possible alternative of installing a median barrier from the available alternatives detailed in Section 7.2.1.2, an incremental benefit-cost analysis was conducted. Barrier systems have an assumed service life of 30 years. Median barriers generally eliminate all cross-over outcomes of collisions, including cross-over fatal collisions. However, median barriers tend to increase overall number of collisions, primarily PDO collisions.

The cost-effective analysis to compare both alternatives was conducted using a benefit-cost ratio (B/C) and on incremental basis, to realize the greatest benefit at the least cost. In this methodology, the alternatives are first ordered from lowest to highest cost. The incremental benefits of the second over the first are calculated by dividing the incremental costs of the second over the first. If the ratio is greater than 1, then alternative 2 is preferred. If the ratio is less than 1 then alternative 1 is superior alternative. The better of these is then compared with the next most costly alternative and so on. The following steps were performed for calculating B/C:

- Estimate life cycle cost of each alternative including capital cost and operating and maintenance cost. The capital cost includes the purchase price, installation cost, and the activities that would not take place otherwise, such as paving, modifications to drainage, etc.)Operating and maintenance cost includes recurring cost of operating and maintaining the system during its useful life;
- Estimate the societal cost[34] of collision for each year that will be prevented by installing the barrier system as estimated over the service life of the barrier system. This was considered as benefit;
- Estimate the societal cost of less severe collisions for each year involving the barrier system, after the barrier system has been put into place. This was considered as negative benefit; and
- Calculate B/C by dividing the present value of the societal benefits by the present value of the life cycle cost.

The methodology with detailed assumptions, calculations and results of the analysis are provided in Appendix A. The results of the analysis are presented in Table 12 and Table 13.

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The life cycle cost of each alternative, as shown in Table 12, includes capital cost and operating and maintenance cost. Further details are available in Appendix A. It should be noted that alternatives in Table 12 are ordered from lowest to highest life-cycle cost for conducting incremental benefit cost

[34] Societal costs of collisions used were based on MTO's current costs of collisions ($ 1,582,000 for a fatal collision, $ 59,000 for an injury collision, and $ 8,000 for a PDO collision)

analysis. The Monetary Benefit of implementing each alternative, as shown in Table 13, includes the estimate of societal cost of collisions that will be reduced by installing the barrier system as estimated over the service life of the barrier system.

Table 12: Costs and benefits of median barrier alternatives

Alternative	Life Cycle Cost	Monetary Benefit
Do-Nothing	$ 0	$ 0
Alternative 2: High Tension Cable Barrier	$2,528,400	$ 13,290,077
Alternative 1: Steel Beam Guide Rail	$3,088,500	$ 11,259,159

Table 13: Results of cost-effective analysis

Comparison	Incremental Cost	Incremental Benefit	Incremental B/C	Preferred Option
Alternative 1 vs. Do-Nothing	$2,528,400	$ 13,290,077	5.26	Alternative 1
Alternative 2 vs. Alternative 1	$560,100	-$2,030,917	-3.63	Alternative 1

As demonstrated in **Table 13**, the only positive increase of more than 1 in incremental B/C is for Alternative 2. Therefore, Alternative 2 consisting of High-Tension Cable Barrier on both sides of the median is the preferred alternative.

The overall B/C of Alternative 2 consisting of High-Tension Cable Barrier on both sides of the median is included in **Table 14**.

Table 14: B/C for High-Tension Cable Barrier

Countermeasure	Target Collisions	Severity	Expected Collisions Before	Expected Crash Reduction	Benefit ($)	Cost ($)	Overall B/C
Install Median Barrier System[35]	Median Related Collisions	Fatal	6.22	4.35	13,290,077	2,528,400	5.26
		Injury	161.69	126.24			
		PDO	205.22	-130.59			

As can be seen in **Table 14**, Alternative 2 is expected to provide a B/C of 5.26 and is a cost-effective option.

8.2 Other Countermeasures

The results of the B/C Analysis for other countermeasures are provided in **Table 15.** The detailed calculations are included in Appendix C.

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[35] Reduction in collisions was estimated based on the proportions of severity of collisions involving High Tension Cable Barriers as identified in the study the results of the study "High Tension Cable Barrier Performance Evaluation Study for Highway 2 in Alberta"

Table 15: B/C for Other Countermeasures

Countermeasure	Target Collisions (Severity)	CMF	Expected Collisions Before	Expected Crash Reduction[36]	Benefit ($)	Cost (Life Cycle)	B/C
Speed Enforcement & Feedback Signs	All (All)	0.88	321.73	38.61	1,178 M	$100,000 (10 years)	11.78
Illumination	Nighttime (All)	0.97	1,728.47	51.85	2,247 M	$810,000 (20 years)	2.77
Permanent Recessed Pavement Markers	Nighttime (All)	0.67	68.65	22.66	1,236 M	$98,800 (5 years)	12.51
Oversized Speed Limit Signs	CMF Not Available						
Slippery When Wet Signs Only	CMF Not Available						
Slippery When Wet Signs with Rain Activated Flashing Beacons	CMF Not Available						
'Merge' Signs	CMF Not Available						
Trim Vegetation Near On-Ramps	CMF Not Available						
Guide Rail End Treatments	CMF Not Available						

9. Conclusion

CIMA was retained by the City of Hamilton to evaluate safety and operational performance of the RHVP and to determine any mitigation measures to improve parkway's performance and reduce number and severity of collisions with special emphasis on median related collisions. CIMA conducted a thorough investigation of the RHVP including investigation of road-related factors, roadside safety assessment, and evaluated the necessity of providing a median barrier and other countermeasures to enhance the safety of road users. After completing the above review, a list of potential countermeasures was developed and a benefit-cost analysis was conducted to determine the cost effectiveness of countermeasures. The following sections provide options that should be given consideration for implementation by the City and a summary table with construction cost and suggested timing for installation.

9.1 Options for Consideration

The following improvements should be considered for implementation on the RHVP.

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[36] Numbers shown are up to two decimals only. Dollar amounts shown may look slightly off due to high societal costs.

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9.1.1 Install Speed Feedback Signs with Enforcement

The installation of two sets of two speed feedback signs should be considered for the RHVP (two sets in each direction, one sign on each side of the road). The recommended locations for the installation of these signs are:

- Northbound direction:
  - Upstream of the curve between Greenhill Avenue and King Street; and
  - Between the King Street on-ramp and the Queenston Road off-ramp.
- Southbound direction:
  - Upstream of the curve between Barton Street and Queenston Road; and
  - Between the Queenston Road on-ramp and the King Street off-ramp.

The purpose of these signs is to influence drivers to reduce speeds and, consequently, collision frequency and severity, especially in the vicinity of the King Street and Queenston Road interchanges. The estimated cost of this countermeasure is $100,000, providing a B/C of 11.78.

It should be noted, however, that the presence of acceleration/deceleration lanes where the signs would be located may reduce their conspicuity for drivers on the mainline right lane. As an alternative, the City may consider to install overhead speed feedback signs.

For increased effectiveness, it is important that the installation of the speed feedback signs be accompanied by regular speed enforcement by Hamilton Police.

The City may also consider investigating the technical feasibility of integrating speed feedback messages (either individual or collective) with the planned ATMS project (refer to **Section 7.1.4.1**).

9.1.2 Install Oversized Speed Limit Signs

The purpose of oversized speed limit signs (90x120 cm) is to influence drivers to reduce speeds and, consequently, collision frequency and severity. A benefit-cost analysis for this countermeasure was not conducted as a CMF for this countermeasure is not available. The estimated cost of this countermeasure is $7,000 (14 signs at $500 per sign).

9.1.3 Conduct Pavement Friction Testing

In order to determine whether low pavement friction may be contributing to collisions (especially wet surface), the City should consider conducting pavement friction tests under normal conditions as well as under typical wet pavement conditions encountered on the RHVP. Special focus should be given to the curves near the King Street and Queenston Road interchanges (**Figure 33**). The estimated cost to conduct friction testing is $40,000. Depending on the test results, the City will be able to determine if further action is required.

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Figure 33: Critical RHVP section for friction testing

9.1.4 Install Permanent Recessed Pavement Markers (PRPMs)

As an alternative to illumination, the City may consider installing PRPMs in the northern section of the RHVP (i.e. north of Greenhill Avenue). The installation of PRPMs is expected to reduce collisions under low-visibility conditions (nighttime and inclement weather), as well as provide consistency throughout the entire length of the RHVP (PRPMs are already present in the southern section, as a result of a previous study conducted in 2013). The estimated cost of installing PRPMs in the north section is $247,000, providing a B/C of 5.

9.1.5 Install Special Oversize Curve Warning Signs

In order to increase drivers' awareness of the curves near the King Street and Queenston Road interchanges, where a high concentration of collisions was found, the City should consider installing special oversize curve warning signs (900x900 mm).[37] A benefit-cost analysis for this countermeasure was not conducted as a CMF for this countermeasure is not available. The estimated cost of this countermeasure is $8,000 (16 signs at $500 per sign).

9.1.6 Install 'Slippery When Wet' and 'Bridge Ices' Signs

The City should consider installing Wc-105 SLIPPERY WHEN WET signs, combined with Wc-5t SLIPPERY WHEN WET tab sign along the study area, in intervals of 1 km or less, in accordance with OTM Book 6 guidelines and to warn drivers of the increased risk of collisions under wet surface conditions. To further highlight the hazard, the signs in the vicinity of the King Street and Queenston Road interchanges may be supplemented with flashing beacons activated by a rain sensor. A benefit-cost analysis for this countermeasure was not conducted as a CMF for this countermeasure is not available. The estimated cost of this countermeasure is $8,000 if only signs are installed (16 signs at $500 per sign), or $128,000 if rain activated flashing beacons are added to 4 signs in the critical section. An alternative, however, is to display 'slippery when wet' messages via the City's planned ATMS project (refer to **Section 7.1.4.1**), which would absorb at least part of this costs.

Additionally, the existing 'Slippery When Wet' signs installed at the two bridges (between Mud Street and Greenhill Avenue, and between Barton Street and the north end of the study area) should be replaced with WC-23 BRIDGE/ROAD ICES signs (MUTCD for Canada), at an estimated cost of

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[37] This sign size is not available in the current version of OTM Book 6, however it will be included in the updated version.

$2,000 (4 signs at $500 per sign). A benefit-cost analysis for this countermeasure was not conducted as a CMF for this countermeasure is not available.

9.1.7 Install Merge' Signs and Trim Vegetation at On-Ramps/Merging Areas

As discussed in **Section 7.1.4.2**, Wa-16 MERGE warning signs should be considered for installation at the Queenston Road E/W-N and Barton Street E/W-S on-ramps to increase driver awareness of the possibility of merging vehicles and potentially reduce evasive manoeuvres that can lead to SMV and sideswipe collisions. A benefit-cost analysis for this countermeasure was not conducted as a CMF for this countermeasure is not available. The estimated cost of this countermeasure is $1,000 (2 signs at $500 per sign).

Additionally, vegetation at the areas between the mainline and some on-ramps should be regularly trimmed and maintained low enough so vehicles approaching from the ramp are visible to drivers on the mainline. This countermeasure is expected to be undertaken as part of regular maintenance activities, therefore no additional cost is associated to it.

9.1.8 Upgrade Guide Rail End Treatments and Improve Object Marker Signs

The City should consider replacing the existing extruder and "fishtail" end treatments of guide rails protecting the bridge structures at Greenhill Avenue, Mount Albion Road, King Street, Queenston Road, and the railway overpass south of King Street, with CAT-350 attenuators, SMART crash cushions or other similar alternatives that comply with the MTO Roadside Safety Manual recommended configuration.

This countermeasure would not apply if and/or where a continuous median barrier is installed. There is no CMF available for upgrading these end treatments, and the estimated cost is $70,000 (2 units x 5 locations at $7,000 per unit).

Additionally, the OBJECT MARKER signs (Wa-33) identified in **Section 5.4.2**, **Table 7** as being missing or damaged should be installed or replaced, respectively. The estimated cost is $3,500 (7 signs at $500 per sign). The signs identified as being obscured by vegetation should be made visible by trimming the vegetation. The cost is expected to be included in the City's regular maintenance activities.

9.1.9 Install High – Tension Cable Median Barrier System

Two median barrier system alternatives for the RHVP were evaluated. The preferred alternative for the RHVP is High-Tension Cable Median Barrier System with present value cost (including the cost of maintenance for 30 years) of $ 2.53 M. The alternative is expected to provide a B/C of 5.26.

It should be noted that the purpose of median barriers is to eliminate median cross-over outcomes of collisions. The installation of a barrier does not necessarily result in fewer collisions, but reduces the severity of collisions. 53% of median related collisions occurred under wet surface condition and a median barrier would come into play after the driver has already lost control. Therefore, it is possible that a reduction of median related collisions will be achieved by addressing speed and wet surface

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related collisions. Collisions could be potentially prevented by using other countermeasures as detailed from Section 9.1.1 to 9.1.8. It would be prudent to implement these countermeasures before implementing median barriers and monitoring their safety performance. It is possible that these countermeasures may improve the safety of the RHVP and reduce the potential benefit of providing a median barrier. The B/C calculations for median barrier as detailed above do not consider the effect of those potential countermeasures.

9.1.10 Install Continuous Illumination

The collision review found that the proportion of non-daylight collisions is higher than provincial and municipal averages, and a review of MTO's policy and warrant indicated that continuous illumination is warranted in the study area. The estimated installation cost for providing continuous illumination is $810,000, providing a B/C of 2.77. However, other factors should be taken into account in the decision to provide illumination along the RHVP mainline, including the context of the surrounding roadway network. For example, while illumination may improve visibility at night, it may also create the situation where drivers' eyes must adjust back to darkness when leaving the illumination portion of the roadway. Currently, the Lincoln Alexander Parkway present only partial interchange illumination, and, considering approval conditions established in the Environmental Assessment, installing illumination could create a situation where, for example, northbound drivers enter a short illuminated section at the south end of the RHVP, followed by a non-illuminated section, and finally back to an illuminated section. For these reasons, illumination is does not appear to be the most adequate solution for the RHVP. All illumination must be assessed in relation to the environmental approval constraints which exist, as well as cost of installation and maintenance implications. Therefore, the decision to provide roadway lighting should be looked at using sound criteria, but illumination decisions must also be done in the context of the surrounding roadway network.

9.2 Summary Table

Table 16 summarizes a prioritized list of countermeasures. The priority has been assigned based on ease of implementation, importance, ability to reduce collisions, and ability to reduce severity. The recommended timing for implementation of each of the countermeasure is also provided in the table.

As indicated in Section 9.1.1, the installation of median barrier should only be considered after evaluating the performance of short –term countermeasures.

Table 16: Countermeasures Summary Table

Countermeasure	Construction Cost ($)	Timeline	Comment
Conduct Speed Enforcement	-	Ongoing	
Trim Vegetation at On-Ramps	-	Ongoing	
Install Oversized Speed Limit Signs	$7,000	Short Term	
~~Install 'Slippery When Wet Signs'~~	~~$8,000~~	~~Short Term~~	
Install Special Oversize Curve Warning Signs	$8,000	Short term	16 signs in the vicinity of King and Queenston interchanges
Supplement 'Slippery When Wet Signs' with Rain Activated Flashing Beacons*	$120,000	Short Term	4 signs in the vicinity of King and Queenston interchanges
Install 'Merge' signs	$1,000	Short Term	
Install 'Bridge Ices' signs	$2,000	Short Term	
Upgrade median guide rail end treatments	$70,000	Short Term	
Install, replace or trim vegetation obscuring Wa-33 signs at guide rail end treatments	$3,500	Short Term	
Conduct Pavement Friction Testing	$40,000	Short Term	
Install Speed Feedback Signs*	$120,000	Short Term	In conjunction with regular speed enforcement; costs may be higher depending on design
Install PRPMs from Greenhill to QEW	$247,000	Short Term	
Short Term Total	$430,300		
Install High-Tension Cable Guide Rail	$2,528,400	Long Term	Consider effect on median related collisions of countermeasures to reduce speed and wet surface collisions
Install Continuous Illumination	$810,000	Long Term	Requires sound evaluation in the context of the surrounding network and environment. An Environmental Assessment will be required.
Grand Total	$4,395,200		

* Implementation costs may be different if integrated with the City's planned ATMS project, for which the estimated cost is $600,000.

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Appendix A: Over-Representation Analysis

Appendix A Over-Representation Analysis

Theoretical Basis

The objective of the over-representation analysis is to help identify which collision factors are over-represented. In other words, this analysis is performed to identify the relationship between collisions and the characteristics of a given location. This process assists in identifying contributing factors at each location. If suitable countermeasures are selected to address the contributing factors, the chance of success significantly increases.

The over-representation analysis is based on the Chi-Square statistical test. To determine if a collision contributing factor is over-represented in collisions at a specific location, both the overall characteristics and the individual category must be found to have a computed value of Chi-Square exceeding the critical theoretical value.

Overall Characteristic

Overall characteristics include the following:

- Collision Classifications;
- Collision Impact Type;
- Day of Week; and
- Season.

The computed value of Chi-Square is calculated using Equation 1, as shown below:

$$\chi^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i} \qquad \text{Eq. 1}$$

Where:

O_i is the observed collision frequency;

n is the total number of categories for the characteristic variable; and

E_i is the expected collision frequency, found by multiplying the total observed collisions at the location with the overall percentage (proportional distribution) of collisions in the category (i.e. A site with 10 observed collisions within a group with 70% as the overall percentage of PDO collisions would have an expected collision frequency of 7).

As shown in Equation 7, the computed Chi-Square value is a measure of discrepancy between the observed and expected collision frequencies. A Chi-Square value of 0 represents no discrepancies between the observed and expected collision frequencies, while a larger value of Chi-Square represents a larger discrepancy.

The computed value of Chi-Square is then compared to the lower and upper theoretical Chi-Square values for the appropriate degrees of freedom and a specified significance level, according to Equation 2.

$$\chi^2_{\text{lower}} \leq \chi^2 \leq \chi^2_{\text{upper}} \qquad \text{Eq. 2}$$

If Equation 2 is false, in other words if the value of the computed Chi-Square is less than the lower theoretical value, or greater than the upper theoretical value, the overall characteristic is found to be over-represented, and the analysis is taken to the individual category level.

The specified significance level for this project was chosen to be 0.05, equivalent to a 95% level of significance. The number of degrees of freedom is calculated using Equation 3 below:

$$df = n - 1 \qquad \text{Eq. 3}$$

The following table shows the degrees of freedom for each characteristic, along with the corresponding critical theoretical values of Chi-Square for a level of significance of 0.05.

Collision Characteristics	Number of Variable Categories (n)	Degrees of Freedom (n-1)	Lower Theoretical χ^2 Value	Upper Theoretical χ^2 Value
Collision Classifications	3	2	0.051	7.38
Light Condition	2	1	0.001	5.02
Environment Condition	7	6	1.24	14.45
Surface Condition	6	5	0.83	12.83
Collision Impact Types	7	6	1.24	14.45
Initial Source of Impact	7	6	1.24	14.45
Driver Action	5	4	0.48	11.14

Individual Category

The individual categories for each overall characteristic considered to conduct the over-representation analysis are presented in the table below.

Overall Characteristics	Individual Categories
Collision Classification	Fatal, Injury, PDO
Light Condition	Daylight, Non-Daylight
Collision Impact Type	Angle, Head On, Rear End, Sideswipe, Turning Movement, SMV, Other
Environment Condition	Clear, Rain, Snow, Freezing Rain, Strong Wing, Fog / Mist / Smoke / Dust, Drifting Snow
Surface Condition	Dry, Wet, Loose Snow, Packed Snow, Ice, Slush
Collision Impact Type	SMV, Overtaking, Animal/Peds, Head On, Angle, Rear End, Sideswipe
Driver Action	Lost Control, Driving Properly, Speed Too Fast, Following Too Close, Improper Lane Change

Once the overall characteristic has been determined to be over-represented, the individual category is analyzed by calculating the Chi-Square value of each category among the characteristic, using Equation 4.

$$\chi_k^2 = \frac{(O_k - E_k)^2}{E_k} + \frac{(X_k - Y_k)^2}{Y_k} \qquad \text{Eq. 4}$$

Where:

$X_k = T_k - O_k$ and $Y_k = R_k - E_k$

O_k is the observed collision frequency for individual collision characteristic category *k*;

E_k is the expected collision frequency for individual collision characteristic category *k*;

T_k is the observed total collision frequency at the location; and

R_k is the expected total collision frequency at the location.

As shown in Equation 4, the computed Chi-Square value is again a measure of the discrepancy between the observed and expected collision frequencies for the collision characteristic category *k*. A Chi-Square value of 0 represents no discrepancies between the observed and expected collision frequencies, while a larger value of Chi-Square represents a larger discrepancy.

The computed value of Chi-Square is then also compared to the lower and upper theoretical Chi-Square values for the appropriate degrees of freedom and a specified significance level, according to Equation 2. If Equation 2 is false, the individual category *k* is found to be over-represented.

The specified significance level remains 0.05 and the number of degrees of freedom is 1, which gives a lower theoretical Chi-Square value of approximately 0.00, and an upper theoretical Chi-Square value of 5.02.

Appendix A Over-Representation Analysis

Results – Light Condition

Light Condition	Ontario			Hamilton		
	Total	Daylight	Non-Daylight	Total	Daylight	Non-Daylight
Observed (Oi)	473	300	173	473	300	173
Other Observed (k)	-	173	300	-	173	300
Database (Ontario/Hamilton)	172639	119759	52880	2927	2188	739
Expected (Ei)	473	328.12	144.88	473	353.58	119.42
Other Expected (Yk)	-	144.88	328.12	-	119.42	353.58
Chi-Value (Oi-Ei) 2/Ei	-	2.41	5.46	-	8.12	24.04
Other Chi-Value (k-Yk) 2/Yi	-	5.46	2.41	-	24.04	8.12
Total Chi-Value	7.87			32.16		
Lower Chi-Value	0.001			0.001		
Upper Chi-Value	5.02			5.02		
Total Over-rep	Yes			Yes		
Category Chi-Values	-	7.87	7.87	-	32.16	32.16
Category Over-rep	-	No	Yes	-	No	Yes

Results – Environment Condition

Environment Condition	Ontario							
	Total	Clear	Rain	Snow	Freezing Rain	Strong Wing	Fog Mist Smoke Dust	Drifting Snow
Observed (Oi)	330	275	16	28	3	2	1	5
Other Observed (k)	-	55	314	302	327	328	329	325
Database (Ontario/Hamilton)	172306	136034	18793	13046	1558	398	1492	985
Expected (Ei)	330	260.53	35.99	24.99	2.98	0.76	2.86	1.89
Other Expected (Yk)	-	69.47	294.01	305.01	327.02	329.24	327.14	328.11
Chi-Value (Oi-Ei) 2/Ei	-	0.80	11.10	0.36	0.00	2.01	1.21	5.14
Other Chi-Value (k-Yk) 2/Yi	-	3.01	1.36	0.03	0.00	0.00	0.01	0.03
Total Chi-Value	20.63							
Lower Chi-Value	1.24							
Upper Chi-Value	14.45							
Total Over-rep	Yes							
Category Chi-Values	-	3.82	12.46	0.39	0.00	2.01	1.22	5.17
Category Over-rep	-	No	No	No	No	No	No	Yes

Environment Condition	Hamilton							
	Total	Clear	Rain	Snow	Freezing Rain	Strong Wing	Fog Mist Smoke Dust	Drifting Snow
Observed (Oi)	330	275	16	28	3	2	1	5
Other Observed (k)	-	55	314	302	327	328	329	325
Database (Ontario/Hamilton)	3436	2708	457	190	16	20	32	13
Expected (Ei)	330	260.08	43.89	18.25	1.54	1.92	3.07	1.25
Other Expected (Yk)	-	69.92	286.11	311.75	328.46	328.08	326.93	328.75
Chi-Value (Oi-Ei) 2/Ei	-	0.86	17.72	5.21	1.39	0.00	1.40	11.27
Other Chi-Value (k-Yk) 2/Yi	-	3.18	2.72	0.31	0.01	0.00	0.01	0.04
Total Chi-Value	37.86							
Lower Chi-Value	1.24							
Upper Chi-Value	14.45							
Total Over-rep	Yes							
Category Chi-Values	-	4.04	20.44	5.52	1.40	0.00	1.41	11.31
Category Over-rep	-	No	No	Yes	No	No	No	Yes

Appendix A — Over-Representation Analysis

Results – Surface Condition

Road Surface Condition	Ontario							Hamilton						
	Total	Dry	Wet	Loose Snow	Packed Snow	Ice	Slush	Total	Dry	Wet	Loose Snow	Packed Snow	Ice	Slush
Observed (Oi)	471	208	239	8	4	9	3	471	208	239	8	4	9	3
Other Observed (k)	-	263	232	463	467	462	468	-	263	232	463	467	462	468
Database (Ontario/Hamilton)	171582	121339	30490	6375	3667	6406	3305	3417	2421	752	96	38	75	35
Expected (Ei)	471	333.08	83.70	17.50	10.07	17.58	9.07	471	333.71	103.66	13.23	5.24	10.34	4.82
Other Expected (Yk)	-	137.92	387.30	453.50	460.93	453.42	461.93	-	137.29	367.34	457.77	465.76	460.66	466.18
Chi-Value (Oi-Ei) 2/Ei	-	46.97	288.18	5.16	3.66	4.19	4.06	-	47.36	176.72	2.07	0.29	0.17	0.69
Other Chi-Value (k-Yk) 2/Yi	-	113.44	62.27	0.20	0.08	0.16	0.08	-	115.11	49.87	0.06	0.00	0.00	0.01
Total Chi-Value	352.21							227.30						
Lower Chi-Value	0.83							0.83						
Upper Chi-Value	12.83							12.83						
Total Over-rep	Yes							Yes						
Category Chi-Values	-	160.41	350.45	5.36	3.74	4.35	4.14	-	162.47	226.59	2.13	0.30	0.18	0.70
Category Over-rep	-	No	Yes	No	No	No	No	-	No	Yes	No	No	No	No

Results – Apparent Driver Action

Apparent Driver Action	Ontario						Hamilton					
	Total	Lost Control	Driving Properly	Speed Too Fast	Following Too Close	Improper Lane Change	Total	Lost Control	Driving Properly	Speed Too Fast	Following Too Close	Improper Lane Change
Observed (Oi)	430	165	111	59	48	47	430	165	111	59	48	47
Other Observed (k)	-	265	319	371	382	383	-	265	319	371	382	383
Database (Ontario/Hamilton)	224518	19923	147890	16535	29974	10196	3870	488	2727	105	427	123
Expected (Ei)	430	38.16	283.24	31.67	57.41	19.53	430	54.22	303.00	11.67	47.44	13.67
Other Expected (Yk)	-	391.84	146.76	398.33	372.59	410.47	-	375.78	127.00	418.33	382.56	416.33
Chi-Value (Oi-Ei) 2/Ei	-	421.66	104.74	23.59	1.54	38.65	-	226.32	121.66	192.04	0.01	81.30
Other Chi-Value (k-Yk) 2/Yi	-	41.06	202.15	1.88	0.24	1.84	-	32.66	290.27	5.36	0.00	2.67
Total Chi-Value	590.18						621.33					
Lower Chi-Value	0.48						0.48					
Upper Chi-Value	11.14						11.14					
Total Over-rep	Yes						Yes					
Category Chi-Values	-	462.72	306.89	25.46	1.78	40.49	-	258.98	411.93	197.39	0.01	83.97
Category Over-rep	-	Yes	No	Yes	No	Yes	-	Yes	No	Yes	No	Yes

Appendix B: Illumination Warrants

FORM 2
FREEWAY - CONTINUOUS ILLUMINATION

Highway: *Red Hill Valley Parkway* ***WP No.:***

Limits: *from: Lincoln M. Alexander Parkway to: Greenhill* ***Name:*** *GB + KH* ***Date:*** *August 31, 2015*

2 pages

CLASSIFICATION FACTOR	RATING (I)					UNLIT WEIGHT (A)	LIGHTED WEIGHT (B)	DIFF (A - B)	SCORE [RATING X (A - B)]
	1	2	3	4	5				
Geometric Factors No. of Lanes (2-way)	4	5	6	7	8	1.0	0.5	0.5	1.00
Lane Width (m)	> 3.75	3.75	3.66	3.50	< 3.50	3.0	2.5	0.5	1.50
Median Width (m)	> 15.0 or barrier		10.0 - 15.0		< 10.0	1.0	0.5	0.5	1.50
Shoulders (m)	3.5	3.25	3.0	2.75	2.5	1.0	0.5	0.5	2.50
Slopes	7:1	6:1	5:1	4:1	< 4:1	1.0	0.5	0.5	2.00
Critical Curves m (deg.)	>3,500 (< 1/2°)	3,500-1,800 (2 - 1°)	1,799-850 (1.1 - 2°)	849-600 (2.1 - 3°)	599-450 (3.1 - 4°)	13.0	4.5	8.5	34.0
Grades (vertical)	< 3%	3 - 3.9%	4 - 4.9%	5 - 6.9%	7%	3.2	2.8	0.4	0.80
Interchange Spacing (km)	>3.0	2.1 - 3.0	1.6 - 2.0	1.0 - 1.5	< 1.0	4.0	1.0	3.0	12.0
							Geometric Total		**55.30**
Operational Factors Level of Service (ii) (any dark hour)	A	B	C	D	E, F	6.0	1.0	5.0	25.0
							Operational Total		**25.0**
Environmental Factors % Development	0%	25%	50%	75%	100%	3.5	0.5	3.0	3.0
Illumination adjacent to Freeway	none	0 - 40%	41 - 60%	61 - 80%	essentially continuous	3.0	1.0	2.0	2.0
							Environmental Total		**5.0**

FORM 2
FREEWAY - CONTINUOUS ILLUMINATION

Highway: *Red Hill Valley Parkway* ***WP No.:***

Limits: *from: Lincoln M. Alexander Parkway to: Greenhill* ***Name:*** *GB + KH* ***Date:*** *August 31, 2015*

2 pages

CLASSIFICATION FACTOR	**RATING (I)**					UNLIT WEIGHT (A)	LIGHTED WEIGHT (B)	DIFF (A - B)	SCORE [RATING X (A - B)]
	1	**2**	**3**	**4**	**5**				
Accidents % of Night-to-Total Accidents (3 yr. avg.) (iii)	< 20%	20 - 30%	31 - 40%	41 - 50%	> 50%	10.0	2.0	8.0	32.0
							Accidents Total		**32.0**
Benefit Cost Ratio (B/C)									

GEOMETRIC TOTAL	= 55.3
OPERATIONAL TOTAL	= 25.0
ENVIRONMENTAL TOTAL	= 5.0
ACCIDENTS TOTAL	= 32.0
SUM	= **117.3 POINTS**
CONTINUOUS ILLUMINATION WARRANTING CONDITION	= **80 points**

i. A rating of between 1 and 5 shall be assigned for each factor in the FORM depending on the conditions that are encountered by motorists on the roadway. The higher the rating, the more critical the need for illumination with regard to that particular factor.
ii. Use LOS methodology approved by the MTO.
iii. For night-to-total accident ratio, accidents during darkness are used (including dusk/dawn).
iv. The number of points for the warranting condition is based on 50% of the total points attainable, if all factors were rated 5.

Note: Worst case scenarios should be considered when assigning the ratings. For example, a section of roadway could have rush hour volumes during the hours of darkness in wintertime.

CIMA+ Note Level of Service is expected to reach E during winter season (PM peak hours can occur during dark hours)

FORM 2
FREEWAY - CONTINUOUS ILLUMINATION

Highway: *Red Hill Valley Parkway* ***WP No.:***

Limits: *from: Greenhill to: QEW* ***Name:*** *GB + KH* ***Date:*** *August 31, 2015*
2 pages

CLASSIFICATION FACTOR	RATING (I) 1	2	3	4	5	UNLIT WEIGHT (A)	LIGHTED WEIGHT (B)	DIFF (A - B)	SCORE [RATING X (A - B)]
Geometric Factors No. of Lanes (2-way)	4	5	6	7	8	1.0	0.5	0.5	0.50
Lane Width (m)	> 3.75	3.75	3.66	3.50	< 3.50	3.0	2.5	0.5	1.50
Median Width (m)	> 15.0 or barrier		10.0 - 15.0		< 10.0	1.0	0.5	0.5	1.50
Shoulders (m)	3.5	3.25	3.0	2.75	2.5	1.0	0.5	0.5	2.50
Slopes	7:1	6:1	5:1	4:1	< 4:1	1.0	0.5	0.5	2.0
Critical Curves m (deg.)	>3,500 (< 1/2°)	3,500-1,800 (2 - 1°)	1,799-850 (1.1 - 2°)	849-600 (2.1 - 3°)	599-450 (3.1 - 4°)	13.0	4.5	8.5	42.50
Grades (vertical)	< 3%	3 - 3.9%	4 - 4.9%	5 - 6.9%	7%	3.2	2.8	0.4	0.40
Interchange Spacing (km)	>3.0	2.1 - 3.0	1.6 - 2.0	1.0 - 1.5	< 1.0	4.0	1.0	3.0	12.0
						Geometric Total			**62.90**
Operational Factors Level of Service (ii) (any dark hour)	A	B	C	D	E, F	6.0	1.0	5.0	25.0
						Operational Total			**25.0**
Environmental Factors % Development	0%	25%	50%	75%	100%	3.5	0.5	3.0	3.0
Illumination adjacent to Freeway	none	0 - 40%	41 - 60%	61 - 80%	essentially continuous	3.0	1.0	2.0	2.0
						Environmental Total			**5.0**

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FORM 2
FREEWAY - CONTINUOUS ILLUMINATION

Highway: *Red Hill Valley Parkway* ***WP No.:***

Limits: *from: Greenhill to: QEW* ***Name:*** *GB + KH* ***Date:*** *August 31, 2015*
2 pages

CLASSIFICATION FACTOR	RATING (I)					UNLIT WEIGHT (A)	LIGHTED WEIGHT (B)	DIFF (A - B)	SCORE [RATING X (A - B)]
	1	2	3	4	5				
Accidents % of Night-to-Total Accidents (3 yr. avg.) (iii)	< 20%	20 - 30%	31 - 40%	41 - 50%	> 50%	10.0	2.0	8.0	24.0
							Accidents Total		**24.0**
Benefit Cost Ratio (B/C)									

GEOMETRIC TOTAL	= 62.9
OPERATIONAL TOTAL	= 25.0
ENVIRONMENTAL TOTAL	= 5.0
ACCIDENTS TOTAL	= 24.0
SUM	= **116.9** **POINTS**
CONTINUOUS ILLUMINATION WARRANTING CONDITION	= **80 points**

i. A rating of between 1 and 5 shall be assigned for each factor in the FORM depending on the conditions that are encountered by motorists on the roadway. The higher the rating, the more critical the need for illumination with regard to that particular factor.
ii. Use LOS methodology approved by the MTO.
iii. For night-to-total accident ratio, accidents during darkness are used (including dusk/dawn).
iv. The number of points for the warranting condition is based on 50% of the total points attainable, if all factors were rated 5.

Note: Worst case scenarios should be considered when assigning the ratings. For example, a section of roadway could have rush hour volumes during the hours of darkness in wintertime.

CIMA+ Note Level of Service is expected to reach E during winter season (PM peak hours can occur during dark hours)

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TAC ATC

Road Name Red Hill Valley Parkway
From Linc to
City Hamilton, ON
Warrant Undertaken by GS+KH
Company name CIMA+
Date August 31, 2015

Warrants for Lighting Freeways (See Note 2)

Item No.	Classification Factor	Rating Factor 'R' 1	2	3	4	5	Weight 'W'	Enter 'R' Here	Score 'R' x 'W'	
	Geometric Factors (See Note 4)									
1	Number of Lanes	≦4	5	6	7	≧8	0.15	2	0.30	
2	Lane Width (m)	>3.6	3.4 to 3.6	3.2 to 3.4	3.0 to 3.2	<3.0	0.30	2	0.60	
3	Median Width (m)	>12	7.5 to 12	3.5 to 7.5	1.2 to 3.5	<1.2	0.30	2	0.60	
4	Shoulder Width (m)	>3	2.5 to 3	1.8 to 2.5	1.2 to 1.8	<1.2	0.30	3	0.90	
5	Off Roadway Embankment Slopes	>6:1	6:1	4:1	3:1	<3:1	0.30	3	0.90	
6	Horizontal Curve Radius (m)	>3500	1750 to 3500	1750 to 875	575 to 875	<575	4.90	4	19.60	
7	Vertical Grades (%)	<3	3 to 4	4 to 5	5 to 7	>7	0.25	2	0.50	
8	Interchange Frequency (No. per km)	>6.5	5.0 to 6.5	3.5 to 5.0	1.5 to 3.5	<1.5	1.85	5	9.25	
							Subtotal Geometric Factors		32.65	G
	Operational Factors									
9	Level of Service (Night, at any Hour)	A	B	C	D	≧E	3.05	5	15.25	
							Subtotal Operational Factors		15.25	O
	Environmental Factors									
10	Percentage of Development Adjacent to Road (%)	nil	nil to 24	25 to 50	50 to 75	75 >	1.85	1	1.85	
11	Distance from Development to Roadway (m) (See Note 3)	>60	45 to 60	30 to 45	15 to 30	<15	1.85	1	1.85	
							Subtotal Environmental Factors		3.70	E
	Collision Factors									
12	Night-to-Day Collision Ratio	<1.0	1.0 to 1.2	1.2 to 1.5	1.5 to 2.0	>2.0 (See Note 1)	4.90	1	4.90	
							Subtotal Collision Factors		4.90	A
							G + O + E + A = Total Warranting Points		56.50	
							Warranting Condition		**60.00**	
							Difference ±		-3.50	D

Notes:
1 Lighting Warranted
2 Operating Speed 80 km/hr (95th percentile night speed should be used if available, other wise posted speed shall be used
3 Development Meaning Commercial, Industrial, Residential Buildings
4 Worst Case Geometric Factors for a Segment of Roadway Shall Apply

CIMA Note Level of Service is expected to reach E during winter season (PM peak hours can occur during dark hours)

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Figure 9-11 – Warrant for Lighting Freeways

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Road Name Red Hill Valley Parkway
From Greenhill to QEW
City Hamilton, ON
Warrant Undertaken by GB+KH
Company name CIMA+
Date August 31, 2015

Warrants for Lighting Freeways (See Note 2)

Item No.	Classification Factor	Rating Factor 'R' 1	2	3	4	5	Weight 'W'	Enter 'R' Here	Score 'R' x 'W'	
	Geometric Factors (See Note 4)									
1	Number of Lanes	≦4	5	6	7	≧8	0.15	1	0.15	
2	Lane Width (m)	>3.6	3.4 to 3.6	3.2 to 3.4	3.0 to 3.2	<3.0	0.30	2	0.60	
3	Median Width (m)	>12	7.5 to 12	3.5 to 7.5	1.2 to 3.5	<1.2	0.30	2	0.60	
4	Shoulder Width (m)	>3	2.5 to 3	1.8 to 2.5	1.2 to 1.8	<1.2	0.30	3	0.90	
5	Off Roadway Embankment Slopes	>6:1	6:1	4:1	3:1	<3:1	0.30	3	0.90	
6	Horizontal Curve Radius (m)	>3500	1750 to 3500	1750 to 875	575 to 875	<575	4.90	5	24.50	
7	Vertical Grades (%)	<3	3 to 4	4 to 5	5 to 7	>7	0.25	1	0.25	
8	Interchange Frequency (No. per km)	>6.5	5.0 to 6.5	3.5 to 5.0	1.5 to 3.5	<1.5	1.85	5	9.25	
						Subtotal Geometric Factors			37.15	G
	Operational Factors									
9	Level of Service (Night, at any Hour)	A	B	C	D	≧E	3.05	5	15.25	
						Subtotal Operational Factors			15.25	O
	Environmental Factors									
10	Percentage of Development Adjacent to Road (%)	nil	nil to 24	25 to 50	50 to 75	75 >	1.85	1	1.85	
11	Distance from Development to Roadway (m) (See Note 3)	>60	45 to 60	30 to 45	15 to 30	<15	1.85	1	1.85	
						Subtotal Environmental Factors			3.70	E
	Collision Factors									
12	Night-to-Day Collision Ratio	<1.0	1.0 to 1.2	1.2 to 1.5	1.5 to 2.0	>2.0 (See Note 1)	4.90	1	4.90	
						Subtotal Collision Factors			4.90	A
						G + O + E + A = Total Warranting Points			61.00	
						Warranting Condition			**60.00**	
						Difference ±			1.00	D

Notes:

1 Lighting Warranted
2 Operating Speed 80 km/hr (95th percentile night speed should be used if available, other wise posted speed shall be used
3 Development Meaning Commercial, Industrial, Residential Buildings
4 Worst Case Geometric Factors for a Segment of Roadway Shall Apply

CIMA Note Level of Service is expected to reach E during winter season (PM peak hours can occur during dark hours)

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Figure 9-11 – Warrant for Lighting Freeways

Appendix C: Evaluation of Providing a Median Barrier

Appendix C Evaluation of Providing a Median Barrier

The selection of best type of median barrier system within the study area was undertaken in the following steps:

- Determination of feasibility of barrier types for the study area;
- Development of alternatives; and
- Selection of the best alternative based on cost-effective analysis.

Determination of Feasibility of Barrier Types for the Study Area

CIMA conducted an analysis of various types of prevailing median barrier technologies in Canada based on MTO's Roadside Safety Manual and AASHTO Roadside Design Guide to determine feasible barrier types for the RHVP. The results of the analysis along with the characteristics of each barrier type that makes it suitable or unsuitable for the RHVP are included in Table 1.

Table 1: Analysis for the Feasibility of Various Barrier Systems for the RHVP

Type of Median Barrier	Relevant Characteristics	Feasibility for the RHVP
6 Cable (Wood Post)	• Not approved for use on high speed facilities	Not feasible for the RHVP due to high speed
6 Cable (Steel Post)	• Recommended for AADT < 20,000 • Ideal for median width greater than 9 m	Not feasible for the RHVP due to high AADT
Median Box Beam Barrier	• Restricted to facilities with posted speeds less than 80 km/h • Recommended for AADT < 30,000	Not feasible for the RHVP due to high AADT and speed
Median Steel Beam Guide Rail with Channel	• Recommended for AADT > 20,000 • Can be installed in medians greater than 9.0 m	Feasible for the RHVP
Standard Concrete Barrier and Ontario "Tall Wall"	• No curbs, gutters or ditches allowed between the barrier and the driving lanes • Area directly in front of barrier must be paved • Should not be located more than 4.0 metres from the edge of the driving lane (maximum width of median to be 9.0 metres)	Not feasible for the RHVP due to a median width larger than 9.0 metres
High-Tension Cable Barrier*	• 2011 AADT range – 25,820 to 46, 200 • Posted Speed – 110 km/h	Feasible for the RHVP
*Based on Successful Alberta experience in addressing cross median collisions by using the High-Tension Cable Barrier system on Highway 2 between Airdrie and Red Deer		

As can be seen in Table 1, Median Steel Beam Guide Rail, and High-Tension Cable Barriers are feasible options for providing a median barrier for the RHVP. It should be noted that all kinds of barrier systems can be transitioned from one type to another by using standard methods. The guidance is available in MTO's Roadside Manual and AASHTO Roadside Design Guide. The appropriate types of transitions should be determined at the detailed design stage.

Based on the feasible barrier options detailed above, various alternatives available for providing a median barrier on the RHVP are as follows:

Appendix C Evaluation of Providing a Median Barrier

Alternative 1: Standard Steel Beam Guide Rail with Channel System on Both Sides of the Median

Provide Standard Steel Beam Guide Rail with Channel systems on both sides of the median. It should be noted that for medians, steel beam guide rails are provided with channel elements to increase the stiffness of the installation[1]. An example Standard Steel Beam Guide Rail with Channel System installed on a median on Highway 403 is demonstrated in Figure 1.

Figure 1: An Example Standard Steel Beam Guide Rail with Channel System

Alternative 2: High Tension Cable Barrier on Both Sides of the Median

Provide High-Tension Cable Barrier on both sides of the median. An example of High Tension Cable Barrier installed on both sides of a median location on Highway 2 in Alberta is demonstrated in Figure 2.

Figure 2 : An Example High Tension Cable Barrier

[1] Section 4.3.5, MTO's Roadside Safety Manual

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Cost Estimate

The detailed cost estimates for the two alternatives are provided in Table 2

Table 2: Alternatives Cost Estimate

	Description	Unit	Qty.	Unit Price $	Total Price $
Alternative 1	Earth Works	M.R.	6000	100	600,000
	Supply & Install Standard Steel Beam Guide Rail with Channel Systems	M.R.	11200	120	1,344,000
	Supply & Install Extruder and Treatment	No.	10	3250	32,500
	Supply & Install Object Marker Warning Sign	No.	10	500	5,000
	30 Years Maintenance Cost ($4500 x 8.2 x 30)				1,107,000
	Total Alternative 1				**$3,088,500**
Alternative 2	Earth Works	M.R.	6000	100	600,000
	Supply & Install High-Tension Cable Barrier	M.R.	11200	72	806,400
	Supply & Install Anchor End Terminal	No.	20	500	10,000
	Supply & Install Object Marker Warning Sign	No.	10	500	5,000
	30 Years Maintenance Cost ($4500 x 8.2 x 30)				1,107,000
	Total Alternative 2				**$2,528,400**

Cost-effective Analysis

In order to select the best possible alternative of installing a median barrier from the available alternatives detailed in Section 1.2, a cost-benefit analysis was conducted. Barrier systems have an assumed service life of 30 years. Median barriers generally eliminate all cross-over collisions including cross-over fatal collisions. However, median barriers tend to increase overall number of collisions, primarily PDO collisions. The methodology and results of the analysis are provided in the following sections.

Methodology

The cost-effective analysis to determine most cost-effective median barrier type was conducted by utilizing the following steps.

Estimate Number of Collisions Likely to Occur

CIMA attempted to develop Safety Performance Functions (SPFs) for median related collisions of the study area. Statistically significant models could not be developed as a result of limited number of segments that can be utilized for the prediction of long term average of median related collisions for the study area. In the absence of SPFs, we used annual average crash rates (Collisions per 100 million vehicles kilometers) to estimate the expected number of median related collisions for future 30 years. Collision distribution (proportions of fatal, injury and PDO collisions) was assumed based on the historical collision data.

Estimate the Severity of Collisions

The next step is based on the assumption that each alternative barrier system would prevent the above number of median related high severity collisions over next 30 years. However, there would be an equal number of collisions of less severity involving each type of barrier system with a different potential of posing harm as a result of a collision.

AASHTO provides Severity Indices (SI) for all types of barrier systems to quantify the potential for harm posed as a result of a collision. Each type of barrier system is assigned a Severity Index (SI), which correlates to the likelihood that the collision will result in a PDO, injury, or a fatality collision. By utilizing the SI for a barrier system, and estimated number of collisions from the previous step, it is possible to estimate the proportions of different collision types. Based on this approach, a collision distribution (PDO, injury, and fatal) for each alternative barrier system can be estimated.

The severity indices provided by AASHTO were further revised based on the recent studies involving median barriers. In this analysis, we utilized the severity results from the following two studies:

- High Tension Cable Barrier Performance Evaluation Study for Highway 2 in Alberta; and
- Cable Median Barrier Program in Washington State.

Table 3 provides the proportions of collisions with different severity levels based on the above noted studies.

Table 3: Proportions of Median Barrier Collisions by Severity

Type of Median Barrier System	Proportions of Median Barrier Collisions		
	Fatal	Injury	PDO
Steel Beam Guiderail	0.007	0.140	0.853
High Tension Cable Barrier	0.005	0.095	0.900

Cost-effective Analysis

The cost-effective analysis to compare both alternatives was conducted using a benefit-cost ratio (B/C) and on incremental basis, to realize the greatest benefit at the least cost. In this methodology, the alternatives are first ordered from lowest to highest cost. The incremental benefits of the second over the first are calculated by dividing the incremental costs of the second over the first. If the ratio is greater than 1, then alternative 2 is preferred. If the ratio is less than 1 then alternative 1 is superior alternative. The better of these is then compared with the next most costly alternative and so on. The following steps were performed for calculating B/C:

- Estimate life cycle cost of each alternative including capital cost and operating and maintenance cost. The capital cost includes the purchase price, installation cost, and the activities that would not take place otherwise, such as paving, modifications to drainage, etc.)Operating and maintenance cost includes recurring cost of operating and maintaining the system during its useful life;

- Estimate the societal cost of collision for each year that will be prevented by installing the barrier system as estimated over the service life of the barrier system. This was considered as benefit;
- Estimate the societal cost of less severe collisions for each year involving the barrier system, after the barrier system has been put into place. This was considered as negative benefit; and
- Calculate B/C by dividing the present value of the societal benefits by the present value of the life cycle cost.

Calculations

The following assumptions were utilized for performing cost-effective analysis calculations according to the methodology detailed above.

- An annual average collision rate of 6.88 collisions per 100 million vehicles kilometres was used for calculating expected number of collisions under existing conditions (without implementing a median barrier system). This collision rate calculated was based on 8 years historical collision data from 2008 to 2015[2].
- Collision distribution used was based on the actual proportions of historical collision data from 2008 to 2015 (1.67% for fatal, 43.33% for injury, and 55.00% for PDO);
- Expected collisions after implementing different types of median barriers were calculated based proportions of fatal, injury, and PDO median related collisions associated with different types of median barrier systems obtained from recent before and after studies[3,4]. Table 4 shows the proportions collisions used for different alternatives.

Table 4: Proportions of Median Related Collisions for Various Alternatives

Alternative	Proportions of Median Related Collisions		
	Fatal	Injury	PDO
Alternative 1 (Steel Beam)	0.007	0.140	0.853
Alternative 2 (High Tension Cable)	0.005	0.095	0.900

- Societal costs of collisions used were based on MTO's current costs of collisions ($ 1,582,000 for a fatal collision, $ 59,000 for an injury collision, and $ 8,000 for a PDO collision).
- An annual average growth factor of 2% was used to project AADT.
- The expected implementation year was considered as 2015.
- The analysis was conducted based on a service life of 30 years for each type of barrier system.

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2 2015 Collision data is only for the first 7 months (1/1/2015 – 23/07/2015)
3 High Tension Cable Barrier Performance Evaluation Study for Highway 2 in Alberta
4 Cable Median Barrier Program in Washington

Appendix C Evaluation of Providing a Median Barrier

Collision rate in collisions per 100 million vehicles kilometres based on historical collision data (2008 – 2015) are shown in Table 5

Table 5: Collision Rate Based on Historical Data

Year	AADT	Number of Collisions	Collision Rate
2008	45,748	6	6.53
2009	55,261	5	4.51
2010	59,123	8	6.74
2011	60,305	5	4.13
2012	61,511	5	4.05
2013	62,741	9	7.15
2014	63,996	13	10.12
2015	65,276	9	11.82
		Average of Collision Rate	**6.88**

Estimate of numbers of collisions likely to occur based on the historical collision rate (6.88 Collisions per 100 Million Vehicles Kilometres) and societal cost of collisions without implementing a median barrier are shown in Table 6

Table 6: Expected Collisions and Societal Cost before Implementing Median Barrier

Year	AADT	Expected Collisions Before	Fatal (1.67%)	Injury (43.33%)	PDO (55.00%)	Expected Societal Cost
2016	66,582	9.20	0.15	3.99	5.06	$518,127.88
2017	67,914	9.38	0.16	4.07	5.16	$528,493.24
2018	69,272	9.57	0.16	4.15	5.26	$539,060.92
2019	70,657	9.76	0.16	4.23	5.37	$549,838.72
2020	72,070	9.96	0.17	4.31	5.48	$560,834.40
2021	73,511	10.15	0.17	4.40	5.59	$572,047.98
2022	74,981	10.36	0.17	4.49	5.70	$583,487.23
2023	76,481	10.56	0.18	4.58	5.81	$595,159.93
2024	78,011	10.78	0.18	4.67	5.93	$607,066.08
2025	79,571	10.99	0.18	4.76	6.05	$619,205.69
2026	81,162	11.21	0.19	4.86	6.17	$631,586.54
2027	82,785	11.44	0.19	4.96	6.29	$644,216.40
2028	84,441	11.66	0.19	5.05	6.42	$657,103.07
2029	86,130	11.90	0.20	5.16	6.54	$670,246.53
2030	87,853	12.14	0.20	5.26	6.67	$683,654.57

Year	AADT	Expected Collisions Before	Fatal (1.67%)	Injury (43.33%)	PDO (55.00%)	Expected Societal Cost
2031	89,610	12.38	0.21	5.36	6.81	$697,327.19
2032	91,402	12.63	0.21	5.47	6.94	$711,272.18
2033	93,230	12.88	0.21	5.58	7.08	$725,497.31
2034	95,095	13.14	0.22	5.69	7.22	$740,010.37
2035	96,997	13.40	0.22	5.81	7.37	$754,811.36
2036	98,937	13.67	0.23	5.92	7.52	$769,908.05
2037	100,916	13.94	0.23	6.04	7.67	$785,308.24
2038	102,934	14.22	0.24	6.16	7.82	$801,011.91
2039	104,993	14.50	0.24	6.28	7.98	$817,034.64
2040	107,093	14.79	0.25	6.41	8.14	$833,376.42
2041	109,235	15.09	0.25	6.54	8.30	$850,045.04
2042	111,420	15.39	0.26	6.67	8.47	$867,048.28
2043	113,648	15.70	0.26	6.80	8.63	$884,386.13
2044	115,921	16.01	0.27	6.94	8.81	$902,074.16
2045	118,239	16.33	0.27	7.08	8.98	$920,112.38
2016	66,582	9.20	0.15	3.99	5.06	$518,127.88
					Total Expected Societal Cost	**$21,019,352.86**

Estimate of numbers of collisions likely to occur after implementation of a median barrier and societal cost of collisions for each alternative are shown in Table 7 to **Error! Reference source not found.** and using proportions from Table 4.

Table 7: Expected Number of Collisions after Implementing Alternative 1 (Steel Beam Guiderail)

Year	Excepted Collisions (Before)	Expected Collisions After			
		Fatal	Injury	PDO	Societal Cost
2016	9.20	0.06	1.29	7.85	$240,589.16
2017	9.38	0.07	1.31	8.00	$245,402.24
2018	9.57	0.07	1.34	8.16	$250,309.27
2019	9.76	0.07	1.37	8.33	$255,313.87
2020	9.96	0.07	1.39	8.49	$260,419.64
2021	10.15	0.07	1.42	8.66	$265,626.59
2022	10.36	0.07	1.45	8.84	$270,938.32

Year	Excepted Collisions (Before)	Expected Collisions After			
		Fatal	Injury	PDO	Societal Cost
2023	10.56	0.07	1.48	9.01	$276,358.46
2024	10.78	0.08	1.51	9.19	$281,887.01
2025	10.99	0.08	1.54	9.38	$287,523.95
2026	11.21	0.08	1.57	9.56	$293,272.91
2027	11.44	0.08	1.60	9.75	$299,137.50
2028	11.66	0.08	1.63	9.95	$305,121.34
2029	11.90	0.08	1.67	10.15	$311,224.41
2030	12.14	0.08	1.70	10.35	$317,450.35
2031	12.38	0.09	1.73	10.56	$323,799.14
2032	12.63	0.09	1.77	10.77	$330,274.40
2033	12.88	0.09	1.80	10.99	$336,879.74
2034	13.14	0.09	1.84	11.21	$343,618.78
2035	13.40	0.09	1.88	11.43	$350,491.52
2036	13.67	0.10	1.91	11.66	$357,501.57
2037	13.94	0.10	1.95	11.89	$364,652.54
2038	14.22	0.10	1.99	12.13	$371,944.43
2039	14.50	0.10	2.03	12.37	$379,384.48
2040	14.79	0.10	2.07	12.62	$386,972.67
2041	15.09	0.11	2.11	12.87	$394,712.63
2042	15.39	0.11	2.15	13.13	$402,607.97
2043	15.70	0.11	2.20	13.39	$410,658.68
2044	16.01	0.11	2.24	13.66	$418,872.00
2045	16.33	0.11	2.29	13.93	$427,247.92
Total Expected Societal Cost After Barrier Implementation					**$9,760,193.47**

Table 8: Expected Number of Collisions after Implementing Alternative 2 (High Tension Cable)

Year	Expected Collisions Before	Expected Collisions After			
		Fatal	Injury	PDO	Societal Cost
2016	9.20	0.05	0.87	8.28	$190,526.96
2017	9.38	0.05	0.89	8.44	$194,338.53

Year	Expected Collisions Before	Expected Collisions After			
		Fatal	Injury	PDO	Societal Cost
2018	9.57	0.05	0.91	8.61	$198,224.50
2019	9.76	0.05	0.93	8.78	$202,187.73
2020	9.96	0.05	0.95	8.96	$206,231.09
2021	10.15	0.05	0.96	9.14	$210,354.57
2022	10.36	0.05	0.98	9.32	$214,561.03
2023	10.56	0.05	1.00	9.51	$218,853.34
2024	10.78	0.05	1.02	9.70	$223,231.49
2025	10.99	0.05	1.04	9.89	$227,695.49
2026	11.21	0.06	1.07	10.09	$232,248.20
2027	11.44	0.06	1.09	10.29	$236,892.48
2028	11.66	0.06	1.11	10.50	$241,631.18
2029	11.90	0.06	1.13	10.71	$246,464.32
2030	12.14	0.06	1.15	10.92	$251,394.75
2031	12.38	0.06	1.18	11.14	$256,422.48
2032	12.63	0.06	1.20	11.36	$261,550.35
2033	12.88	0.06	1.22	11.59	$266,781.25
2034	13.14	0.07	1.25	11.82	$272,118.02
2035	13.40	0.07	1.27	12.06	$277,560.66
2036	13.67	0.07	1.30	12.30	$283,112.05
2037	13.94	0.07	1.32	12.55	$288,775.03
2038	14.22	0.07	1.35	12.80	$294,549.62
2039	14.50	0.07	1.38	13.05	$300,441.53
2040	14.79	0.07	1.41	13.31	$306,450.76
2041	15.09	0.08	1.43	13.58	$312,580.17
2042	15.39	0.08	1.46	13.85	$318,832.63
2043	15.70	0.08	1.49	14.13	$325,208.14
2044	16.01	0.08	1.52	14.41	$331,712.42
2045	16.33	0.08	1.55	14.70	$338,345.47

Appendix D: Benefit-Cost Analysis for Other Countermeasures

The Benefit-Cost (B/C) ratio is the ratio of the present value of the safety benefit of a given countermeasure calculated for its service life to the present value of the cost of the countermeasure. A B/C ratio of greater than 1.0 represents an economically efficient countermeasure. In this criterion, the monetary value of the collisions reduced as a result of implementation of a countermeasure is considered as the benefit of the countermeasure. For the purposes of calculating the societal costs of collisions, MTO costs were utilized. Details of the B/C analysis for countermeasures other than median barrier are included in the following tables.

Provide Speed Feedback Signs

The CMF for this countermeasure is 0.88, and the construction cost is $10,000 per site for a service life of 10 years.

Collision rate of total collisions in collisions per 100 million vehicles kilometres based on historical collision data (2008 – 2015[1]):

Year	AADT	Number of Total Collisions	Collision Rate
2008	45,748	10	26.04
2009	55,261	11	23.71
2010	59,123	22	44.32
2011	60,305	29	57.28
2012	61,511	24	46.48
2013	62,741	38	72.15
2014	63,996	37	68.87
2015	65,276	26	81.69
		Average of Collision Rate	**52.57**

Estimate of number of total collisions likely to occur based on the historical collision rate (36.14 collisions per 100 million vehicles kilometres) and societal cost of collisions without implementing speed feedback signs during next 10 years (service life of signs). 2015 is the assumed implementation year. The proportions of different severity collisions of total collisions shown in the header of the following table are based on the actual experienced during the history period.

[1] 2015 Collision data is only for the first 7 months (1/1/2015 – 23/07/2015)

Year	AADT	Total Collisions	Fatal (0.00%)	Injury (44.16%)	PDO (55.84%)	Expected Societal Cost
2016	66,582	29.38	0.00	12.98	16.41	$896,843.06
2017	67,914	29.97	0.00	13.24	16.73	$914,784.77
2018	69,272	30.57	0.00	13.50	17.07	$933,076.70
2019	70,657	31.18	0.00	13.77	17.41	$951,732.31
2020	72,070	31.80	0.00	14.05	17.76	$970,765.07
2021	73,511	32.44	0.00	14.33	18.11	$990,174.98
2022	74,981	33.09	0.00	14.61	18.48	$1,009,975.51
2023	76,481	33.75	0.00	14.91	18.85	$1,030,180.14
2024	78,011	34.43	0.00	15.20	19.22	$1,050,788.87
2025	79,571	35.11	0.00	15.51	19.61	$1,071,801.68
	Total	**321.73**	**0.00**	**142.08**	**179.65**	**$9,820,123.09**

Societal Cost of Expected Collisions = 0.00 x 1,582,000 + 142.08 x 59,000 + 179.65 x 8,000
= $9,820,123.09

Average Cost of Total Expected Collisions = $9,820,123.09/ 321.73 = $30,522.84

<u>Reduction in Collisions after Implementing Speed Feedback Signs (CMF = 0.88)</u>

Expected Reduction in collisions = 321.73 x (1 – CMF)
= 38.61

Monetary Benefits = 38.61 x $30,522.84 = $1,178,486.85

Construction Cost = $12,500 x 8
= $100,000

B/C = 11.78

Illumination

The CMF for this countermeasure is 0.97, and the construction cost is $100,000 per site for a service life of 20 years.

Collision rate of total collisions in collisions per 100 million vehicles kilometres based on historical collision data (2008 – 2015):

Year	AADT	Number of Total Collisions	Collision Rate
2008	45,748	43	31.79
2009	55,261	37	22.65
2010	59,123	51	29.18
2011	60,305	71	39.82
2012	61,511	67	36.84
2013	62,741	80	43.13
2014	63,996	71	37.53
2015[2]	65,276	54	48.17
		Average of Collision Rate	**36.14**

Estimate of number of total collisions likely to occur based on the historical collision rate (36.14 collisions per 100 million vehicles kilometres) and societal cost of collisions without implementing illumination during next 20 years (service life of illumination). 2015 is the assumed implementation year. The proportions of different severity collisions of total collisions shown in the header of the following table are based on the actual experienced during the history period.

Year	AADT	Total Collisions	Fatal (0.84%)	Injury (43.25%)	PDO (55.91%)	Expected Societal Cost
2016	66,582	71.14	0.60	30.77	39.77	$3,083,123.33
2017	67,914	72.56	0.61	31.38	40.57	$3,144,802.46
2018	69,272	74.01	0.62	32.01	41.38	$3,207,685.55
2019	70,657	75.49	0.64	32.65	42.21	$3,271,818.88
2020	72,070	77.00	0.65	33.30	43.05	$3,337,248.78
2021	73,511	78.54	0.66	33.97	43.91	$3,403,975.23
2022	74,981	80.11	0.68	34.65	44.79	$3,472,044.55
2023	76,481	81.72	0.69	35.34	45.68	$3,541,503.04
2024	78,011	83.35	0.70	36.05	46.60	$3,612,350.69
2025	79,571	85.02	0.72	36.77	47.53	$3,684,587.52
2026	81,162	86.72	0.73	37.50	48.48	$3,758,259.82
2027	82,785	88.45	0.75	38.25	49.45	$3,833,413.91
2028	84,441	90.22	0.76	39.02	50.44	$3,910,096.08
2029	86,130	92.02	0.78	39.80	51.45	$3,988,306.33
2030	87,853	93.87	0.79	40.60	52.48	$4,068,090.98

[2] 2015 Collision data is only from the first 7 months (1/1/2015 – 23/07/2015)

Year	AADT	Total Collisions	Fatal (0.84%)	Injury (43.25%)	PDO (55.91%)	Expected Societal Cost
2031	89,610	95.74	0.81	41.41	53.53	$4,149,450.02
2032	91,402	97.66	0.82	42.24	54.60	$4,232,429.76
2033	93,230	99.61	0.84	43.08	55.69	$4,317,076.50
2034	95,095	101.60	0.86	43.94	56.80	$4,403,436.56
2035	96,997	103.64	0.87	44.82	57.94	$4,491,509.92
	Total	**1728.47**	**14.59**	**747.54**	**966.34**	**$74,911,209.91**

Societal Cost of Expected Collisions = 14.59 x 1,582,000 + 747.54x 59,000 + 966.34x 8,000
= $74,911,209.91

Average Cost of Total Expected Collisions = $74,911,209.91/ 11728.47= $43,339.66

<u>Reduction in Collisions after Implementing Rumble Strips (CMF = 0.97)</u>

Expected Reduction in collisions = 1728.47 x (1 – CMF)
= 51.85

Monetary Benefits = 51.85 x $43,339.66 = $2,247,336.30

Construction Cost = $100,000 x 8.1
= $810,000

B/C = 2.77

Provide Permanent Recessed Pavement Markings

The CMF for this countermeasure is 0.67, and the construction cost is $19,000 per km of length for a service life of 5 years.

Collision rate of total night collisions in collisions per 100 million vehicles kilometres based on historical collision data (2008 – 2015):

Year	AADT	Number of Total Collisions	Collision Rate
2008	45,748	7	10.22
2009	55,261	9	10.88
2010	59,123	9	10.17
2011	60,305	11	12.19
2012	61,511	12	13.04
2013	62,741	22	23.43
2014	63,996	19	19.84
2015[3]	65,276	6	6.14
		Average of Collision Rate	**13.24**

Estimate of number of total collisions likely to occur based on the historical collision rate (13.24 collisions per 100 million vehicles kilometres) and societal cost of collisions without implementing permanent raised pavement markings during next 5 years (service life of PRPM). 2015 is the assumed implementation year. The proportions of different severity collisions of total collisions shown in the header of the following table are based on the actual experienced during the history period.

Year	AADT	Total Collisions	Fatal (2.11%)	Injury (26.32%)	PDO (71.58%)	Expected Societal Cost
2016	66,582	13.19	0.28	3.47	9.44	$719,727.60
2017	67,914	13.46	0.28	3.54	9.63	$734,126.04
2018	69,272	13.72	0.29	3.61	9.82	$748,805.54
2019	70,657	14.00	0.29	3.68	10.02	$763,776.89
2020	72,070	14.28	0.30	3.76	10.22	$779,050.92
	Total	**68.65**	**1.45**	**18.07**	**49.14**	**$3,745,486.99**

Societal Cost of Expected Collisions = 1.45 x 1,582,000 + 18.07 x 59,000 + 49.14 x 8,000

= $3,745,486.99

Average Cost of Total Expected Collisions = $3,745,486.99/ 49.14 = $54,557.89

Reduction in Collisions after Implementing Speed Feedback Signs (CMF = 0.67)

Expected Reduction in collisions = 68.65 x (1 – CMF)

= 22.66

[3] 2015 Collision data is only from the first 7 months (1/1/2015 – 23/07/2015)

Appendix D Benefit-Cost Analysis

Monetary Benefits	= 22.66 x $54,557.89 = $1,236,010.71
Construction Cost	= $247,000.00
B/C	= 5.00

3027 Harvester Road, Suite 400
Burlington, ON L7N 3G7
CANADA
T. 289.288.0287
F. 289.288.0285

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CITY OF HAMILTON
PUBLIC WORKS DEPARTMENT
Corporate Assets and Strategic Planning Division

Hamilton

TO:	Chair and Members Public Works Committee
COMMITTEE DATE:	April 4, 2016
SUBJECT/REPORT NO:	Hamilton Strategic Road Safety Program Update (PW16027) (City Wide) (Outstanding Business List Item)
WARD(S) AFFECTED:	City Wide
PREPARED BY:	David Ferguson Superintendent, Traffic Engineering 905-546-2424 Extension 2433 Martin White, C.E.T., Manager Traffic Operations and Engineering, 905-546-2424 Extension 4345
SUBMITTED BY: **SIGNATURE:**	Geoff Lupton Director, Energy, Fleet & Traffic Public Works Department

RECOMMENDATION

(a) That the Hamilton Strategic Road Safety Program for 2016, as described in Appendix F to Report PW16027, be endorsed;

(b) That the Hamilton Strategic Road Safety Program's Mission, Vision and Goal's be revised to include a third goal, "That the Hamilton Strategic Road Safety Program supports the Principals and Values of Vision Zero";

(c) That the Senior Project Manager, Traffic Roadway Safety, currently funded for a three year period ending in 2017, be confirmed as a full time permanent position in the 2018 budget process with the position continuing to be funded from the Red Light Camera Reserve 112203 with no impact on the municipal tax levy;

(d) That the Vision Zero – Comprehensive Plan to Improve Road Safety Motion be identified as complete and removed from the Public Works Committee Outstanding Business List.

EXECUTIVE SUMMARY

On August 15, 2014 City Council approved the Public Works Committee report PW14090 - Re-establishment of the Hamilton Strategic Road Safety Program (HSRSP). With this report Council approved the following:

(a) That Council endorse the re-establishment of the City of Hamilton's, Hamilton Strategic Road Safety Program (RSRSP) as outlined in Report PW14090 and the reformation of the Hamilton Strategic Road Safety Committee;

(b) That all excess Red Light Camera (RLC) program fine revenues not required to build, operate, manage or maintain existing or future Red Light Camera sites, be allocated to road safety initiatives, as supported by the principles of the Hamilton Strategic Road Safety Program outlined in this report;

(c) That a Senior Traffic Safety Technologist be hired on a contract basis and funded from the Red Light Camera Reserve (112203) with no impact to the municipal tax levy;

(d) That the Senior Traffic Safety Technologist be hired for a contract term of three years;

(e) That staff report back to Committee prior to completion of the contract term on the cost and benefits realized with this new position;

(f) That $545,000 be allocated from the Red Light Camera Reserve (112203) to fund 2014 safety initiatives as outlined in Report PW14090;

(g) That the Hamilton Strategic Road Safety Committee report on the progress and results of the Hamilton Road Safety Program annually through the Public Works Committee.

The purpose of this report is to provide:

An update on the Hamilton Strategic Road Safety Program as of year-end 2015.

Provide the rationale for converting the Senior Project Manager, Traffic Roadway Safety from a contract position to a permanent FTE with no impact to the Levy.

To seek Councils endorsement of the proposed HSRSP initiatives for 2016 outlined in this report.

Council's approval to incorporate the principles of Vision Zero as an additional goal added to the HSRSP. This is in response to a City Council passed Motion on February 26, 2016 related to Vision Zero – Comprehensive Plan to Improve Road Safety.

Funding for all the roadway safety projects is financed by revenues realized from the Red Light Camera Program, itself a sustainable roadway safety program. Currently there is approximately $9.5 million dollars accumulated in the reserve. These funds were committed by Council in report PW07116 "That all excess Red Light Camera Program fines revenues not required to build, operate or maintain existing or future Red Light Camera sites be allocated to road safety initiatives, as supported by the Hamilton Strategic Road Safety Program, subject to maintaining a minimum balance of $100,000 in the Red Light Camera Reserve 112203". This is at no impact to the municipal tax levy.

Hamilton Strategic Road Safety Committee

The Hamilton Strategic Road Safety Committee was re-convened on March 18, 2015. The committee is comprised of staff members from Hamilton Police Services, Public Health Services, Traffic Operations & Engineering, Transportation, and Communications. In addition, consultation has been held with multiple school boards, and the Seniors Advisory Committee. The goal of the Committee is to provide guidance, oversight and direction to the Hamilton Strategic Road Safety Program; to ensure additional stakeholder input and consultation is sought; and to ensure that the Program includes Education, Enforcement and Engineering, together to reduce collisions and improve safety for all roadway users in Hamilton. The Committee met eight times in 2015.

Hamilton Strategic Road Safety Program Results

Table 1 below provides a summary of the activities completed as of year-end 2015. The total cost of the projects completed as part of the Hamilton Strategic Road Safety Program as of year-end 2015 was approximately $1.55 million ($532,000 of this total was spent in 2013 and 2014 on Ladder crosswalks). Therefore the City spend in 2015 was actually $618,000 in 2015 on the Traffic Safety Initiatives listed below. Staff where able to complete some additional safety enhancements from the $545,000 identified in in report PW14090. These initiatives were entirely funded from the Red Light Camera Reserve, with no impact to the levy.

Table 1 - Hamilton Strategic Roadway Safety Initiatives Completed as of Year-end 2015

Project/Program	Results to Date
A. Speed limit reductions to 40 km/hr	• 207 local roadway speed limit reductions to 40 km/hr primarily in School Safety Zones and on local residential roadways. • Approximately 1,000 speed limit signs were installed at an approx. cost of $200,000 (See Appendix A for locations).
B. School Safety Zones	• 60 School Area reviews and 110 School Safety Zones have been completed. • 40 intersections converted to all-way stops. • The installation of all way stop control and school area signing cost about $60,000. • Speed reduction signing and school zone flasher costs are captured separately (See Appendix B for locations).
C. New school zone flasher speed zones	• Three new school zone flasher speed zones were installed. • Approximate cost of $45,000 (See Appendix C for locations).

Project/Program	Results to Date
D. Ladder crosswalks	• 211 durable plastic ladder crosswalks have been installed across the City over the last three years (53 in 2013, 49 in 2014 and 109 in 2015). • The total 3-year expenditure for this initiative was approx. $1.1 million (2013 at $276,000, 2014 at $256,000, 2015 at $568,000) • Please see Appendix D for locations.
E. Traffic Calming Projects	• 17 temporary traffic calming projects completed. • Installations include bump outs and knock down sticks and 19 temporary speed humps. • Approximate cost $100,000 (See Appendix E for locations).
F. Emergency Detour Routes (EDR)	• Red Hill Valley Parkway (RHVP) and Highway 403. • Cost approximately $15,000.
G. Permissive vs. prohibitive signing review for Truck Routes.	• Review completed • Study cost $28,550.
H. Roadway safety adjustments	• Such as Right Turn on Red signing for Seniors at Fennell and Upper Gage, and Mohawk and Upper Gage etc.

<u>Senior Project Manager - Traffic Safety Engineering</u>

In January 2015, the Senior Project Manager (SPM), Traffic Safety Engineering position was successfully filled on a three year contract basis. The incumbent has been instrumental in successfully initiating and guiding road safety staff and projects to date. In addition, with the growth of Traffic safety initiatives, this position will now be supervising nine staff in total. This position provides project supervision and co-ordination of the growing project list as described in this report. The SPM also works with other municipalities, the provincial government, Councillors and interest groups, seniors, school boards, and citizens in order to ensure Traffic Safety Engineering provides timely and accurate responses to meet the needs of the citizens of Hamilton and to meet the Mission, Vision and Goals of the HSRSP.

Staff recommends that the Senior Project Manager, Traffic Roadway Safety, currently funded for a three year period ending in 2017, be confirmed as a full time permanent position in the 2018 budget process and the position continue to be funded from the Red Light Camera Reserve 112203 with no impact on the municipal tax levy. The estimated annual salary and benefit cost for the position is $120,000. In 2016, Traffic changed the Community Traffic Section into the Traffic Roadway Safety Section to recognize the shift in strategic priority to Roadway Safety as a primary focus.

Hamilton Strategic Road Safety Program for 2016

A summary of the HSRSP projects for 2016 are listed in Appendix F and are described in detail below.

1.0 New Pedestrian Crossover Program

On January 1st, 2016, Bill 31 legislative amendments to the *Ontario Highway Traffic Act (H.T.A.) sections 140 and 176* came into effect that will require drivers to stop and yield the entire roadway to pedestrians and school crossing guards before proceeding at designated pedestrian crossovers and school crossings. With these amendments to the *Ontario Highway Traffic Act*, the Province has introduced three new variations of the pedestrian crossover. These new crossing treatments will allow pedestrians to cross the road right-of-way under a greater number of conditions and will provide municipalities with a more cost effective solution to ensure pedestrian safety. These changes to the H.T.A. result in significant change to the Rules of the Road for Ontario and will help address initiatives identified in the Hamilton Strategic Road Safety Program to make roads safer for school children, pedestrians and school crossing guards.

The major change in legislation is for new pedestrian crossovers and school crossings. A motorist must now yield the right of way to the pedestrian and not proceed until the pedestrian has completely left the roadway. The Pedestrian, must also ensure that the vehicle has sufficient space to come to a stop before they proceed with their crossing.

For 2016 staff will continue to work with municipal partners and community groups to raise awareness of existing regulations. Staff will develop a Communication Plan that will include educational and marketing materials prior to installation of any new pedestrian crossovers.

The following conditions must be met in order for a Pedestrian Cross Over (PXO) to be implemented under the H.T.A.:

- Appropriate pedestrian and vehicle volumes
- Pedestrian facilities on both sides of the road that are maintained in the winter
- Appropriate sight lines
- Located within a roadway segment with a posted speed limit of 60 km/h or less
- Accessibility for Ontarians with Disabilities Act (AODA) compliant curb cut and sidewalk depressions at the crossing
- Not within 200 meters of another crossing control treatment (unless pedestrian and vehicle volumes are high and there is a requirement for system connectivity)
- Illuminated with street lighting matching Provincial standards for such treatments

It is anticipated that Traffic will implement an initial pilot project of three to five (3-5) P.X.O. crossings in 2016. There will be an Education Program associated with the installation of these pedestrian priority crossings. This programs estimated cost is $100,000 in 2016 and approximately $500,000 in 2017 with a full rollout of various pedestrian crossings complete with LED fast flashing beacons, and/or appropriate signing and pavement markings, being implemented at candidate locations for the future.

2.0 School Zone Safety Program

The purpose of this program is to provide designated safe routes to school, focused on providing children a safer, calmer environment to commute and also to encourage walking and cycling modes of travel compatible with a safer healthy lifestyle. Under the supervision of the Senior Project Manager, Traffic Safety Engineering, a school safety review process was created in 2015. The process involves technical safety staff from Traffic Engineering, Public Health Services, school boards, and representatives from each school and the Parent Teacher Association. To date, 60 school zone reviews have been conducted leading to 250 streets having the speed limit reduced to 40 km/hr, school safety zones, new school zone flashers and new all way stops have been installed around schools. In addition, this program has been used to install a multitude of durable ladder crosswalks at locations on designated routes to and from school and at locations controlled by supervised school crossing guards. This program will continue to operate and grow until a review has been conducted on roadways in proximity to all schools in Hamilton (60 of 188 have been completed to date).

3.0 Speed Limit Designation Review

The City of Hamilton along with other stakeholder Municipalities is working with the Provincial Government on an initiative to support a change in legislation to the *Highway Traffic Act* (H.T.A.) to enable Municipalities to reduce the default speed limit on municipal roadways to 40km/hr under the H.T.A., rather than existing 50km/hr as required under current legislation. In principal, this would allow Hamilton to reduce all local residential roadway speed limits to 40km/hr while signing all other designated collector and arterial roadways as 50km/hr or greater as required by roadway operating conditions, land use and roadway purpose.

Further consultation with the province, stakeholder municipalities and enforcement agencies including the Hamilton Police Services is required before this legislative change is enacted. It is not known at this time how long this process will take as it is in the initial stages of review by the Province. In the interim Hamilton has reduced the speed limit to 40km/hr using speed limit signs on roadways within school safety zones, and on roadways in internal subdivisions where the speed limit of 40km/hr is appropriate. These speed limit reductions can be installed concurrently with other traffic calming measures such as lane width reductions, bump outs speed bumps, bike lanes and other measures to control and calm the speed of vehicles. These individual reviews will continue until such time as the Province changes the existing H.T.A. legislation.

4.0 Red Light Camera and Intersection Safety Review.

As part of the Red Light Camera program Traffic recommended in report PW 14087 to install 6 new red light cameras. This report was subsequently approved at Council on August 16, 2014. In report PW 15073 approved by Council in October 2015 it was further approved that approval be granted to continue to operate the Red Light Camera (RLC) Program in Hamilton through to the end of 2021. The Red Light Camera Program is a successful collision reduction program.

Collision statistics were reviewed at all existing red light camera locations over a 3 to 5 year period before and after the red light camera device was implemented. Based on the review of collision data, right-angle collisions on average have declined among the 12 intersections reviewed from a total of 133 collisions before installation to 74 collisions after. The total number of collisions at these locations has reduced from 439 collisions before installation to 363 collisions after installation. Staff also reviewed violations that the red light cameras have generated from the start of the program compared to current operation. It was noted that the average number of violations have declined from 6.9 violations/day to 3.5 violations/day from the start of the red light camera program in year 2000 to current operations. These numbers indicate that compliance has doubled since the inception of the red light camera initiative which contributes to improvements to the safe operation of the road network.

These statistics indicate that red light cameras are proving to be an effective tool in reducing right-angle and total collisions at locations where red light camera devices have been implemented. As part of the implementation of a red light camera, site specific characteristics are reviewed at each individual location including traffic signal amber and all-red clearance intervals. The amber and all red clearance intervals are calculated and based on roadway speed and intersection design which is a consistent practice throughout the City of Hamilton and the Province of Ontario. Vehicles that are travelling at a speed in close proximity to the posted speed limit would have sufficient space to come to a complete stop safely or if they are closer in proximity to the intersection be able to clear the intersection prior to the start of the all red phase. Overall, the Red Light Camera Program is responsible for a reduction in right-angle collisions. This indicates that this program is very successful in improving the safety and efficiency for road users in the City of Hamilton. Traffic staff will be reporting further to Public Works Committee and Council on the Red Light Camera Program in 2016.

5.0 New Permanent Traffic Calming Program

In 2016 Traffic will implement a new pilot program to remove temporary traffic calming features and construct permanent traffic calming features using hard surface materials asphalt and concrete. The estimated (Est.) total program budget for 2016 is $120,000.

- Permanent bump out – Locke @ Herkimer – Est. $20,000 (Ward 1)
- Centre Median Island – Longwood @ Marion – Est. $20,000 (Ward 1)
- Two Speed humps – Charlton near Kent – Est. $20,000 (Ward 1)
- Permanent speed humps on Forbes and Citino – Est. $20,000 (Ward 8)
- Permanent speed hump – Highgate near Bankfield – Est. $10,000 (Ward 9)
- Permanent speed hump – Winterberry – Est. $10,000 (Ward 9)
- Raised crosswalk Winterberry at trail crossing – Est. $20,000 (Ward 9)

6.0 New School Zone Flasher Upgrade and Replacement

Currently there are 69 School Zone Flashers in operation in Hamilton. A review has been conducted of the condition and age of the asset and it has been determined that almost all are out of date and are not compatible with current programming and operating technologies. Traffic recommends replacing these units over a five year period with School Zone Flashers that contain current programming technology and that can be integrated into the new Advanced Traffic Management Centre for control and monitoring and remote programming and operations. The annual budget cost per year for each of five years is $120,000.

7.0 New Collision System Software Upgrade and Collision Report

The City has been operating the current Collision Software since 1999 and it is outdated. The current software requires each collision to be individually keyed into the system. Data extraction and collision summary is cumbersome and has to be conducted by dedicated staff. It is recommended that the City research and purchase a state of the art software for Collision record processing). The new State-of-the-Art analytical Collision reporting tools are quick and easy to use, while remaining highly flexible. They provide analytical tools; GIS map based information, collision reports, intersection and mid-block collision diagrams, problem area analysis and viewing. Most new collision system software packages can be installed on the desktop of all technical traffic staff as well as the Hamilton Police Services and any trained individual can create reports to suit their needs. The anticipated front end costs for purchase and set up of the system and licencing is approximately $100,000. Annual License and processing fees are estimated to be approximately $15,000 per year.

Upon upgrading the software, Traffic will be able to easily and relatively quickly run statistics and produce the Traffic Safety Status Collision Report, an annual collision report summarizing collision statistics in Hamilton. This report was last produced in 2010 and must be updated. This report and the statistics are paramount to measuring collision rates in Hamilton, comparing Hamilton rates to other municipalities and for monitoring collision rate reductions as a result of the actions of the Hamilton Strategic Road Safety Program.

8.0 Red Hill Valley Parkway (RHVP) and Lincoln Alexander Expressway (LINC) Vehicle Speed Monitoring

As Part of the Hamilton Strategic Road Safety Program, Traffic reported in report PW15091 respecting collision mitigation on the RHVP and The LINC and recommended a list of short term, medium and long term actions to reduce collisions. One of the recommendations to reduce collisions resulting from motorist speeding was to request additional Hamilton Police Services (HPS) speed and aggressive driving enforcement on these roadways. The Police have conducted speed enforcement over this winter and have observed that the incidents of speeding have reduced while Police are present. Traffic staff and HPS staff met in January 2016 to determine a permanent means for HPS to monitor the speed of traffic on the expressways. It was agreed that Traffic will utilize the new Advanced Traffic Management System technology and install new speed monitoring cameras on the RHVP and the LINC and provide the HPS with a display of the images and recorded vehicle speeds, such that they can monitor expressway condition and provide enforcement based on real time conditions and observations. The estimated cost to provide the equipment and system monitoring is approximately $200,000.

9.0 Continuation of Projects/ Programs for 2016

- Speed limit reductions to 40km/hr primarily in School Safety Zones and on local residential roadways (Est. budget $200,000).
- School Area reviews and establish School Zones via the use of signs and markings (Est. budget $60,000).
- Install school zone flasher speed zones (Est. budget $75,000).
- Install approximately 125 durable plastic ladder crosswalks as required (Est. budget $700,000). Ladder crosswalks consist of two conventional crosswalk lines that run parallel with the direction of pedestrian travel connected by alternating bands of reflective white plastic creating a "ladder like" appearance. The alternating pattern of white lines and darker pavement provides contrast and enhances the visibility of the crosswalk which increases conspicuity and driver awareness. The increased visibility of the crosswalk better defines the pedestrian area with the goal of improving safety and walkability. These markings, on average, last for approximately five years, while latex based markings average between six and twelve months (depending upon traffic conditions). While the life-cycle costs of the two materials are similar, the durability and efficacy of the MMA product is far superior and results in a better end-user experience.
- Traffic Calming – temporary projects including: rubberized speed humps, bump outs, knock down sticks (Est. budget $250,000).
- Emergency Detour Routes (EDR) installations on Hamilton roadways for the M.T.O. for the QEW EDR (Est. budget $15,000).

10.0 Other Traffic Safety Initiatives

Traffic Safety is the overall foundation of Traffic Engineering and staff undertakes projects and initiatives based on varying requests. Staff are working on completing the following initiatives listed below. The estimated budgeted for these other projects is $150,000.

- Sherman Hub Study Area and partnership study with Mohawk College
- Safe Neighbourhoods Signage Program
- Recessed LED pavement markers pilot project (Whitechurch Rd)
- Neighbourhood Traffic Calming reviews
- Initiatives related to addressing Age Friendly Issues within the City of Hamilton

- Arterial radar message boards which is administered by Hamilton Police Services as well as the local neighbourhood radar boards which is administered by Traffic Engineering staff
- Safety requests from the public and Councillors

11.0 Vision Zero – Comprehensive Plan to Improve Road Safety

Vision Zero is the 1997 Swedish approach to road safety thinking. It can be summarized in one sentence: No loss of life is acceptable. The Vision Zero approach has proven highly successful and has been adopted by City's such as the City of Edmonton and New York City and a number of other Municipalities in the United States.

At City Council on February 26, 2016, Council passed a Motion respecting Vision Zero, directing staff as follows:

That the General Manager of Public Works be directed, in consultation with other City Departments, as appropriate, to report to the Public Works Committee in coordination with the Transportation Master Plan, with a comprehensive plan to improve road safety to include, but not be limited to, the following:

(i) A review of best practice from comparable jurisdictions including Vision Zero;
(ii) A review of existing City policies, strategies and guidelines respecting road safety;
(iii) An enhanced analysis of city-wide traffic collision data;
(iv) Specific recommendations to improve road safety, particularly for pedestrians, cyclists and motorists, over the short term, medium and long terms;
(v) An implementation plan and funding strategy, as appropriate;
(vi) A regular reporting mechanism and track progress;
(vii) Continued consultation with the Hamilton Cycling Committee, Hamilton Wentworth District School Board, Hamilton Wentworth Catholic District School Board and all other educational entities in the city of Hamilton who wish to participate; to include but not be limited to the Hamilton Catholic French District School Board, the Hamilton French District School Board, Mohawk College, McMaster University, and Redeemer College University, Public Health Services, Hamilton Police Services, Cycle Hamilton, the Advisory Committee for Persons with Disabilities, the Agriculture & Rural Affairs Advisory Committee and the Seniors Advisory Committee; and,
(viii) The creation of a Road Safety Task Force is to be led by the Public Works Department.

The principles outlined in items (ii) through (viii) of the motion are incorporated into the Hamilton Strategic Road Safety Program. Please refer to Table 2 below for staff's responses to how they believe the HSRSP currently addresses motion items (ii) through (viii). Staff responses are in Italic.

Table 2 – Staff Responses to Motions (ii) through (viii)

(ii) A review of existing City policies, strategies and guidelines respecting road safety;
The Hamilton Strategic Road Safety Program and subsequently the Hamilton Strategic Road Safety Committee were formed in 2007 by direction of City Council (PW07116). Subsequently in August 2014, Council approved report PW14090 to re-establish this Strategic and comprehensive plan to improve road safety. Most other significant Canadian and North American Municipalities have similar programs to Hamilton; some are modelled after the Hamilton Strategic Road Safety Program which was one of the first programs of its kind in Ontario.
(iii) An enhanced analysis of city-wide traffic collision data;
Item 7.0 New Collision System Software Upgrade and Collision Report of the Hamilton Strategic Road Safety Program for 2016 speak to this item. Upgrading the City current software, will enable easily and relatively quickly run statistics and produce the Traffic Safety Status Collision Report, an annual collision report summarizing collision statistics in Hamilton. Commencing in 2016, Hamilton will re-introduce the Annual Traffic Safety Status Report as well high incident collision locations will be identified for collision reduction treatments. These reports will provide enhanced analysis of city-wide traffic collision data. The reports and the statistics are paramount to measuring collision rates in Hamilton, comparing Hamilton rates to other municipalities and for monitoring collision rate reductions as a result of the actions of the Hamilton Strategic Road Safety Program. A review of current collision trends shows that in general collision and fatality statistics over the past 25 years are in a downward trend. The implementation of Collision reduction measures on a holistic City wide basis only commenced in 2015. The statistics will need to be reviewed annually to determine the success of these programs in the coming years. Please refer to Appendix G for a 25 year Collision history of Total Collisions, Fatal and Injury Collisions in Hamilton.
(iv) Specific recommendations to improve road safety, particularly for pedestrians, cyclists and motorists, over the short term, medium and long terms;
This report contains specific recommendations to improve road safety for all roadway users over the short term, medium and long terms. Other initiatives from the Traffic Section of public works such as the Red Light Camera program and the Bicycle Route Master Plan implementation also are designed as long term strategies for improved safety and mobility in Hamilton. The City of Hamilton also has other strategies that have road safety components built into them, The Pedestrian Mobility Plan, the Traffic Calming Plan, the Transportation Master Plan, all support roadway safety and mobility in Hamilton.
(v) An implementation plan and funding strategy, as appropriate;
Funding for all the roadway safety projects is financed by revenues realized from the Red Light Camera Program, itself a sustainable roadway safety program. Currently

there is approximately $9.5 million dollars accumulated in the reserve. These funds were committed by Council in report PW07116 "That all excess Red Light Camera Program fines revenues not required to build, operate or maintain existing or future Red Light Camera sites be allocated to road safety initiatives, as supported by the Hamilton Strategic Road Safety Program, subject to maintaining a minimum balance of $100,000 in the Red Light Camera Reserve 112203". This is at no impact to the municipal tax levy.
(vi) A regular reporting mechanism and track progress; The Hamilton Strategic Road Safety Committee is required to report on the progress and results of the Hamilton Road Safety Program annually through the Public Works Committee.
(vii) Continued consultation with the Hamilton Cycling Committee, Hamilton Wentworth District School Board, Hamilton Wentworth Catholic District School Board and all other educational entities in the city of Hamilton who wish to participate; to include but not be limited to the Hamilton Catholic French District School Board, the Hamilton French District School Board, Mohawk College, McMaster University, and Redeemer College University, Public Health Services, Hamilton Police Services, Cycle Hamilton, the Advisory Committee for Persons with Disabilities, the Agriculture & Rural Affairs Advisory Committee, and the Seniors Advisory Committee; and, The Hamilton Strategic Road Safety Committee is comprised of membership from Traffic, Transportation, Communications, Hamilton Police Services, and Public Health Services. In addition, consultation has been held with the school boards, local school staff and various Parent Teacher groups, and the Seniors Advisory Committee and the Social Planning and Research Council of Hamilton. Continued consultation with the Hamilton Cycling Committee, Hamilton Wentworth District School Board, Hamilton Wentworth Catholic District School Board and all other educational entities in the city of Hamilton who wish to participate; the Hamilton Catholic French District School Board, the Hamilton French District School Board, Mohawk College, McMaster University, and Redeemer College University, Public Health Services, Hamilton Police Services, Cycle Hamilton, the Advisory Committee for Persons with Disabilities, the Agriculture & Rural Affairs Advisory Committee, and the Seniors Advisory Committee will be arranged in 2016. In addition, staff from Hamilton Traffic are members of the Road Safety Committee of Ontario (ROSCO) made up of professional Traffic Engineering staff from Hamilton, Waterloo Region, Richmond Hill, North Bay, Mississauga, Durham, Halton, Peel, Kitchener, Oakville, Brampton, Ottawa, London, Milton, Niagara, Toronto, York, Ministry of Transportation (Ontario), Consultant companies. Together these members exchange ideas, programs and best practices to improve road safety on roadways in Ontario. Hamilton is regarded as a leader in roadway safety within this group. Hamilton is also a voting member of the TAC (Transportation Association of Canada) Road Safety Standing Committee.

(viii) The creation of a Road Safety Task Force is to be led by the Public Works Department.

The Hamilton Strategic Road Safety Committee was re-convened on March 18, 2015. The committee is comprised of staff members from Hamilton Police Services, Public Health Services, Traffic Operations & Engineering, Transportation, and Communications as its core membership. In addition, consultation has been held with multiple school boards, and the Seniors Advisory Committee. The goal of the Committee is to provide guidance, oversight and direction to the Hamilton Strategic Road Safety Program and to ensure that additional stakeholder input and consultation is sought for specific program development. The Committee is to ensure that the Program includes Education, Enforcement and Engineering are considered together to reduce collisions and improve safety for all roadway users in Hamilton. The Committee met eight times in 2015.

The Roadway Safety Section of Traffic designs and implements the roadway safety plans such as those described in this report. These plans are discussed with the Hamilton Strategic Road Safety Committee who endorse and support the programs and provide multi departmental oversight over the projects and priorities.

Vision Zero, Vision, Mission and Goals

Vision Zero is the 1997 Swedish approach to road safety thinking. It can be summarized in one sentence: No loss of life is acceptable. The Vision Zero approach has proven highly successful and has been adopted by City's such as the City of Edmonton and New York City and a number of other Municipalities in the United States. Vision Zero, is based on the simple fact that people are human and humans make mistakes. The road system needs to keep us moving. But it must also be designed to protect road users at every turn.

The current Council approved Hamilton Strategic Road Safety Program (HSRSP) Vision, Mission and Goals are:

VISION: To have the best road safety record in Canada.

MISSION: To improve the quality of life of the citizens of Hamilton through a reduction in property damage and injury and death resulting from traffic collisions.

PRIMARY GOAL: Reduce fatal and injury collisions (combined), and property damage only collisions each by 10% every three year period.

SECONDARY GOAL: The City of Hamilton, Ontario be recognized as having the safest traffic record in Canada.

Staff suggests that the Hamilton Strategic Road Safety Program Vision, Mission and Values are already aligned with the Principals and Values of Vision Zero. To further link the HSRSP to Vision Zero, staff recommended that the Hamilton Strategic Road Safety Program Mission, Vision and Goals be revised to support the Principals and Values of Vision Zero. This will acknowledge the linked values and goals. Staff therefore recommends revising the HSRSP goals to three distinct goals as outlined below which includes adding the specific new goal related to Vision Zero.

Hamilton Strategic Road Safety Program Goals:

1. Reduce fatal and injury collisions (combined), and property damage only collisions each by 10% every three year period.
2. The City of Hamilton, Ontario be recognized as having the safest traffic record in Canada.
3. That the Hamilton Strategic Road Safety Program supports the Principals and Values of Vision Zero.

Alternatives for Consideration – See Page 17

FINANCIAL – STAFFING – LEGAL IMPLICATIONS

Financial: The proposed funding model for all costs associated with the Hamilton Strategic Road Safety Program would be to utilize funds from the Red Light Camera Reserve Fund (112203). Funds from the municipal tax levy will not be required to support these programs.

2016 Budgeted Road Safety funds:

New Pedestrian Crossover Program	$100,000
Public Safety and Education Campaign	$110,000
Permanent Construction – Traffic Calming	$120,000
School Zone Flasher Upgrade and Replacement	$120,000
Collision System Upgrade	$100,000
RHVP/LINC Speed Monitoring	$200,000
Speed Reduction signing	$200,000
School Zone signing	$60,000
School Zone Flasher Installation	$75,000
Durable Ladder Crosswalks	$700,000
Temporary Traffic Calming	$250,000
EDR Installation	$15,000
Miscellaneous Safety requests	$150,000
Total (Est.)	$2,200,000

The Red Light Camera (RLC) Reserve (112203) currently accumulates average annual net revenue of approximately $2,000,000. With the addition of six new Red Light Camera locations; this revenue is expected to climb to about $2.5 million annually. At the time of this report the balance in the RLC Reserve was at $9.5 million. Use of this fund to support safety initiatives would enable a proactive approach to the City of Hamilton's Strategic Road Safety Program.

Staffing: It is recommended that the Senior Project Manager, Traffic Roadway Safety, currently funded for a three year period ending in 2017, be confirmed as a full time permanent position in the 2018 budget and the position continue to be funded (salary and benefit value $120,000 per year) from the Red Light Camera Reserve 112203 with no impact on the municipal tax levy.

Legal: There are no Legal Implications from this report

HISTORICAL BACKGROUND

On August 15, 2014 City Council approved report PW14090 Re-establishment of the Hamilton Strategic Road Safety Program (City Wide). Shortly after the re-establishment of the Program, staff reconvened the Hamilton Strategic Road Safety Committee comprised of members of Traffic, Transportation, Communications, Hamilton Police Services, and Public Health Services. In addition, consultation has been held with multiple school boards, and Seniors Advisory Committee. The goal of the Committee is to provide guidance, oversight and direction to the Road Safety Program; to ensure additional stakeholder input and consultation is sought; and to ensure that the Program includes the 3E's (Education, Enforcement and Engineering) together to reduce collisions in Hamilton. The Committee has met eight times to date.

The Hamilton Strategic Road Safety Program (HSRSP) established the following Vision, Mission and Goals.

VISION: To have the best road safety record in Canada.

MISSION: To improve the quality of life of the citizens of Hamilton through a reduction in property damage and injury and death resulting from traffic collisions.

PRIMARY GOAL: Reduce fatal and injury collisions (combined), and property damage only collisions each by 10% every three year period.

SECONDARY GOAL: The City of Hamilton, Ontario be recognized as having the safest traffic record in Canada.

In report PW14090 it was reported that specific actions for emphasis areas identified by the HSRSP will be reviewed by staff and the committee and action plans will be established. Areas to be considered under the HSRSP can include:

- New pedestrian crossing program
- School zone safety program
- Speed limit designation review
- Vulnerable road user safety and education program
- Red light camera and intersection safety review
- Detailed collision analysis
- Road safety marketing and education campaign
- Aggressive driving
- Cyclist safety
- Transit/transit riders
- Winter weather
- Impaired driving
- Commercial vehicles

- Work zone safety
- Enhanced speed trailer initiative
- Pavement marking upgrade program
- Heavy truck traffic assessment and program evaluation
- Emergency detour routing administration and freeway management control
- Specialized safety initiatives and review that would further enhance road safety for all users.

The Mission and Vision of the Hamilton Traffic Road Safety Program is to make roadways throughout the City of Hamilton the safest throughout North America and to address safety for ALL road users, including vulnerable road users such as seniors and children and to reinvest Red Light Camera (RLC) revenue into safety initiatives in the Community.

Furthermore, in report PW14090 it was recommended that a Senior Traffic Safety Technologist be hired on a contract basis and funded from the Red Light Camera Reserve (112203) with no impact to the municipal tax levy.

Subsequent to the approval of the report in 2014, the Traffic Section of Public Works began to initiate the projects and items identified in the report. In January 2015 the position of Senior Project Manager, Traffic Safety Engineering was successfully filled on a three year contract basis. The incumbent has been instrumental in successfully initiating and guiding road safety staff and projects to date. In order for the entire scope of the Hamilton Strategic Road Safety Program to continue to be successful, this position is required to provide continuing oversight of the staff and growing project list as described in this report, provide research and to co-ordinate with other municipalities, provincial government, councillors and interest groups, seniors, school boards, and citizens in order to provide responsive Traffic Safety Engineering to meet the needs of the citizens of Hamilton and to meet the Mission, Vision and Goals of the HSRSP and also to ideologies such as Vision Zero.

POLICY IMPLICATIONS AND LEGISLATED REQUIREMENTS

N/A

RELEVANT CONSULTATION

The Hamilton Strategic Road Safety Committee is comprised of membership from Traffic, Transportation, Communications, Hamilton Police Services, and Public Health Services. In addition, consultation has been held with the school boards, local school staff and various Parent Teacher groups, and the Seniors Advisory Committee and the Social Planning and Research Council of Hamilton. Continued consultation with the Hamilton Cycling Committee, Hamilton Wentworth District School Board, Hamilton Wentworth Catholic District School Board and all other educational entities in the city of Hamilton who wish to participate; the Hamilton Catholic French District School Board, the Hamilton French District School Board, Mohawk College, McMaster University, and Redeemer College University, Public Health Services, Hamilton Police Services, Cycle Hamilton, the Advisory Committee for Persons with Disabilities, the Agriculture & Rural

Affairs Advisory Committee, and the Seniors Advisory Committee will be arranged in 2016.

ANALYSIS AND RATIONALE FOR RECOMMENDATION

The goal of any road safety program is to improve safety and to reduce the number of collisions that occur on municipal roadways and to reduce the social, economic impacts that occur as a result of motor vehicle collisions and the overall safety of all road users including pedestrians and cyclists.

Collision and Fatality Impacts

The impacts of collisions and fatalities far exceed the time and costs which are incurred at the time of the incident. Collisions and fatalities impact families, friends and often whole communities in a negative manner.

In 2007, the Transportation Association of Canada published a report on the Analysis and Estimation of the Social Cost of Motor Vehicle Collisions in Ontario. This report outlines that motor vehicle collisions generated $18 billion in social costs in Ontario. Across all collision severities, the average social cost of a collision in Ontario is approximately $77,000. The average cost/incident based on severity is as follows:

- Fatality - $13,600,000
- Major Injury - $280,000
- Minor Injury - $48,000
- Minimal Injury - $18,000

Social Costs include an extensive number of factors including, traffic delays, damage to property, legal fees, funeral costs, insurance costs, pollution costs, out of pocket expenses, hospital/health care; tow trucks, EMS, lost wages, future earnings.

No amount of money could compensate any family who loses a family member or has a family member that is seriously injured in a collision. It is the goal of the Hamilton Strategic Road Safety Program to reduce and eliminate fatal collisions and reduce overall collision numbers to as low as possible.

Approval of this report emphasises the City of Hamilton's commitment to collision reduction providing and improving roadway safety for all road users

ALTERNATIVES FOR CONSIDERATION

Council has made significant investments into improving road safety for all users through the re-establishment of the Hamilton Strategic Road Safety Program, the Committee and through other initiatives such as the Red Light Camera program and the Bicycle Route Master Plan. The Pedestrian Mobility Plan, the Traffic Calming Plan, the Transportation Master Plan. The Hamilton Strategic Road Safety Program is funded from Red Light Camera Reserve 112203". This is at no impact to the municipal tax levy.

The City of Hamilton could choose to modify program, through modifying the funding model to either reduced or increased its investment. Reductions in funding, would lead to a reduction in the number of safety initiatives implemented an increase in funding could potentially require additional staffing resources to meet program expectations.

A modified funding which model decreased program investment could negatively impact the overall success of the Hamilton Strategic Road Safety Program and slow the progress in implementing various safety enhancements. It could also impact Council's 2012 - 2015 Strategic Plan, Strategic Priority #1 and Strategic Priority #2 by reducing the service to a Prosperous and Healthy Community and reducing the Priority for Valued and Sustainable Services.

ALIGNMENT TO THE 2012 – 2015 STRATEGIC PLAN

Strategic Priority #1

A Prosperous & Healthy Community

WE enhance our image, economy and well-being by demonstrating that Hamilton is a great place to live, work, play and learn.

Strategic Objective

1.2 Continue to prioritize capital infrastructure projects to support managed growth and optimize community benefit.

1.5 Support the development and implementation of neighbourhood and City wide strategies that will improve the health and well-being of residents.

Strategic Priority #2

Valued & Sustainable Services

WE deliver high quality services that meet citizen needs and expectations, in a cost effective and responsible manner.

Strategic Objective

2.2 Improve the City's approach to engaging and informing citizens and stakeholders.

2.3 Enhance customer service satisfaction.

APPENDICES AND SCHEDULES ATTACHED

Appendix A – 40 KMH Speed Limits Installed in 2016

Appendix B – School Safety Reviews Completed in 2016

Appendix C – All School Zone Flashers in Hamilton

Appendix D – Ladder Crosswalks 2013 - 2015

Appendix E – All Temporary Speed Humps in Hamilton

Appendix F – 2016 Budgeted Road Safety Initiatives

Appendix G – Motor Vehicle Collision History – 1991 TO 2015

Hamilton

INFORMATION UPDATE

TO:	Mayor Fred Eisenberger and Members of City Council
DATE:	May 11, 2016
SUBJECT/REPORT NO:	LINC/RHVP Safety Improvements (Wards 4, 5, 6, 7, 8 and 9)
WARD(S) AFFECTED:	Wards 4, 5, 6, 7, 8 and 9
SUBMITTED BY: **SIGNATURE:**	Geoff Lupton Director of Corporate Assets & Strategic Planning Public Works Department

At the December 9th, 2015 Council meeting, Council approved report PW15091 directing staff to implement the short-term safety options identified in Appendix C to PW Report 15-016 on the Redhill Valley Parkway (RHVP) and Lincoln Alexander Expressway (LINC) to improve safety and reduce collisions. The recommendations are as follows:

(a) That the General Manager of Public Works be directed to implement the short-term safety options identified in Appendix A and that these options be funded from the Red Light Camera Reserve (112203) and that staff be directed to report back to Public Works Committee on the results;

(b) That the design with request to the medium and long term items in Appendix B be deferred pending the outcome of the Transportation Master Plan (TMP) update;

(c) That a request be made to the Hamilton Chief of Police and the Hamilton Police Services Board to undertake regular speed and aggressive driving enforcement on the Lincoln M. Alexander Parkway (LINC) and the Red Hill Valley Parkway (RHVP) and that they be requested to report back to Council annually on the results;

(d) That a copy of PW15091 report be provided to the Joint Stewardship Board of the Red Hill Valley for information.

Staff has completed an implementation plan to complete the approved Short term works over the summer of 2016. As these works will require various lane closures, involve various departments and multiple contractors, staff are proposing the closure of both the RHVP and LINC over a weekend in July and possibly some night closures to complete the works. The closure is required to protect workers and keep costs to minimum while completing the improvements as quickly as possible. This is a similar approach to what the City of Hamilton used previously for the LINC to complete regular maintenance. The specific date(s) have yet to be determined and more details will be provided once an implementation plan is completed. During the closure, staff will be co-ordinating for the following works to be completed.

Improvement/Safety Enhancements	Completion Date
Trim Vegetation on on-ramps, Queenston Rd. and Barton St.	July Closure
Install Oversized Speed Limit Signs	July Closure
Install "Slippery When Wet" Signs	June 2016
Install "Merge" and "Bridge Ices" Signs	June 2016
Upgrade Guiderail end treatments	July Closure
Install, replace or trim vegetation obscuring signs at Guiderail End Treatments	July Closure
Install Digital Speed Feedback Signs	September 2016
Install Permanent Raised Pavement Markings from Greenhill to QEW	July Closure
Install Object Marker signs on Guiderail End Treatments	June 2016
Install Advance Diagrammatic Sign on Rousseaux on-ramp west of Mohawk Road	July Closure
Install Advance sign with Advance Right Lane Exits, Next Lane Exit or Through sign between Hwy 403 and Mohawk Rd.	July Closure
Install Speed Fine Information Signs	July Closure
Install Permanent Raised Pavement Markings from Greenhill to QEW	July Closure

Staff has been working in partnership with Hamilton Police Services investigating various types of digital radar feedback signs that would meet the needs of both organizations. The new digital information radar feedback signs will be controlled through the Traffic Management Centre and will provide notifications to Hamilton Police Services of the Operating speeds along both roadways so they can deploy enforcement resources as needed. Hamilton Police Service has been conducting regular enforcement on both the RHVP and the LINC and over a 4 month period have issued over 1600 violations. This new system, which is to be installed in September of 2016, will allow the City and Hamilton Police Services with the ability to monitor vehicle speeds efficiently and deploy resources as needed.

The approved recommendations also identified the need to review and implement a Queue –End Warning System, Rain Activated- "Slippery When Wet" Flashing Beacons and a Variable Speed Limit on the RHVP and LINC. Traffic Engineering will be retaining a consultant to review, recommend and design systems to address these three items. It is expected these items would become activated in the spring of 2017.

Report PW 15-016 identified the installation of rumble strips along the LINC as a long term implementation (6+ years). Public Works Committee and Council provided further direction to staff to undertake a feasibility review of Rumble Strips on the LINC between Highway 403 and the RHVP, with special attention paid to Noise implications. Transportation Planning and Engineering Services is currently conducting this feasibility review and will be reporting to a future Public Works Committee meeting in 2016.

In addition to safety improvements, a new signing plan will be installed for the Upper Redhill Valley Parkway. This will include oversized ground mounted signs and replacement of various overhead signs on the RHVP and LINC to coincide with the opening of the new section of roadway in 2016.

If you require further information on this matter, please contact Martin White, Manager of Traffic Operations and Engineering at extension 4345.

Copy to:

Chris Murray, City Manager
John Mater, Acting General Manager, Public Works
Rose Caterini, City Clerk, General Manager's Office
Lauri Leduc, Legislative Coordinator, General Manager's Office
Mike Zegarac, General Manager, Finance & Corporate Services
Anna Apkarian, Manager of Finance & Administration, Public Works
Jen Recine, Senior Communications Officer, City Manager's Office
Kwab Ako-Adjei, Policy & Public Affairs Advisor, City Manager's Office
Martin White, Manager, Traffic Operations & Engineering, Public Works
Dave Ferguson, Superintendent of Traffic Engineering, Public Works
Kris Jacobson, Superintendent of Traffic Operations, Public Works
Kim Wyskiel, Superintendent of Traffic Services, Public Works

Hamilton

INFORMATION UPDATE

TO:	Mayor Fred Eisenberger and Members of City Council
DATE:	May 20, 2016
SUBJECT/REPORT NO:	The Lincoln M. Alexander Parkway (LINC) & Red Hill Valley Parkway (RHVP) Safety Improvements (Wards 4, 5, 6, 7, 8 and 9) (CASP1615)
WARD(S) AFFECTED:	Wards 4, 5, 6, 7, 8 and 9
SUBMITTED BY: **SIGNATURE:**	Geoff Lupton Director of Energy, Fleet & Traffic Public Works Department

The purpose of this report is to advise Council of the anticipated implementation schedule for the short-term (0-2 years) traffic safety improvements identified for the Lincoln M. Alexander Parkway (LINC) & Red Hill Valley Parkway (RHVP). These measures were approved by Council on December 9, 2015 (PW15091). The short-term measures were identified in Appendix A of that report. These measures are to be funded from the Red Light Camera (RLC) Reserve (112203). Staff was also directed to report back to Public Works Committee on the results or impacts of these safety enhancements. Medium and long term safety items identified in Appendix B of the report were deferred pending the outcome of the Transportation Master Plan (TMP) update.

Implementation of most of the approved short-term safety items has been planned for the summer of 2016. The remaining short-term initiatives are planned for implementation in 2017. As these works involve various departments and multiple contractors, the recommended improvements will be implemented in stages over the next several months (beginning in June). Given the complexity of the work, full closures of both the RHVP and the LINC may be required during off-peak hours. Should full closures be required, appropriate notice will be provided to Council and the public well in advance.

Although the implementation of the various improvements requires significant coordination, staff anticipates undertaking the work in accordance with the following timing outlined in Table 1.

Table 1 - Short-Term Safety Enhancements/ Improvements for the LINC & RHVP

Short-Term Safety Enhancements/ Improvements to be Implemented in 2016	Estimated Completion Dates
Trim Vegetation on on-ramps, Queenston Rd. and Barton St.	June - July
Install Oversized Speed Limit Signs	June - July
Install "Slippery When Wet" Signs	June - July
Install "Merge" and "Bridge Ices" Signs	June - July
Install Speed Fine Information Signs	June - July
Upgrade Guiderail End Treatments	September - November
Install, replace or trim vegetation obscuring signs at Guiderail End Treatments	July - August
Install Object Marker Signs on Guiderail End Treatments	September - November
Install Permanent Raised Pavement Markings from Greenhill to QEW	Timing pending pavement review. Possible resurfacing.
Install Advance Diagrammatic Sign on Rousseaux on-ramp west of Mohawk Road	August – September*
Install Advance Sign with Advance Right Lane Exits, Next Lane Exit or Through Sign between Hwy 403 and Mohawk Rd.	August – September*
Installation of Signs Stating the Penalties and Costs Associated with Speeding.	September - October
* Timing is tentative - Coordination and approval is required from Ministry of Transportation.	

The remaining short-term safety enhancements identified in PW15091 require further analysis. These include the implementation of a Queue–End Warning System, Rain Activated – "Slippery When Wet" Flashing Beacons and a Variable Speed Limit on the LINC and RHVP. Staff will be retaining a consultant to review, recommend and design systems to address these three items. It is expected that these items would be implemented in 2017.

The Public Works Committee Report PW 15-016 also identified the installation of edgeline rumble strips along the LINC as a long term (6 plus years) implementation measure. Public Works Committee and Council provided further direction to staff to undertake a feasibility review of rumble strips on the LINC between Highway 403 and the RHVP, with special attention to be given to noise implications. Engineering Services is reviewing this request and will be reporting back to a future Public Works Committee meeting in 2016.

In addition to these safety improvements, a signing plan has been designed and will be installed for the new Upper Red Hill Valley Parkway interchange. This will include oversized ground mounted signs and replacement of various overhead signs on the LINC and the RHVP to coincide with the opening of the new section of roadway in 2016.

Staff are currently working in partnership with Hamilton Police Services investigating various types of digital radar speed feedback signs that would meet the needs of both groups. The new digital information radar feedback signs will monitor vehicle speeds on the LINC and the RHVP and provide appropriate feedback to drivers through variable message signs. The new system would be controlled through the Traffic Management Centre and will provide notifications to Hamilton Police Services of the operating speeds along both roadways. This would enable the police to deploy selective enforcement resources as needed. Hamilton Police Services has been conducting regular enforcement on both the LINC and the RHVP and have issued over 1600 violations in four months. This new system will provide the City of Hamilton and Hamilton Police Services with the ability to monitor vehicle speeds efficiently and deploy resources as needed.

If you require further information on this matter, please contact Martin White, Manager of Traffic Operations and Engineering at extension 4345.

Copy to:

Chris Murray, City Manager, City Manager's Office
John Mater, Acting General Manager, Public Works
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Martin White, Manager, Traffic Operations & Engineering, Public Works
Dave Ferguson, Superintendent of Traffic Engineering, Public Works
Kris Jacobson, Superintendent of Traffic Operations, Public Works
Kim Wyskiel, Superintendent of Traffic Services, Public Works
Betty Matthews-Malone, Director of Operations, Public Works
Gary Moore, Director of Engineering Services, Public Works

Lorissa Skrypniak, Acting Manager, Transportation Management, Public Works
Inspector Will Mason, Hamilton Police Services, Support Services Division

INFORMATION REPORT

Hamilton

TO:	Chair and Members Public Works Committee
COMMITTEE DATE:	September 19, 2016
SUBJECT/REPORT NO:	Lincoln M. Alexander Parkway and Red Hill Valley Parkway Lighting (PW16077) (City Wide) (Outstanding Business List Item)
WARD(S) AFFECTED:	City Wide
PREPARED BY:	Gord McGuire (905) 546-2424, Extension 2439 Mike Field (905) 546-2424, Extension 4576
SUBMITTED BY: **SIGNATURE:**	Gary Moore, P. Eng Director, Engineering Services Division Public Works Department

Council Direction:

At its meeting of December 7, 2015 the Public Works Committee directed staff to "report to the Public Works Committee with information on the costs and process of investigating an improved lighting system on the Red Hill Valley Parkway and the Linc."

This direction was in response to the Public Works Committee's review and discussion of the The Lincoln M. Alexander Parkway (LINC) & Red Hill Valley Parkway (RHVP) Safety Review report PW15091.

Information:

The Lincoln M. Alexander Parkway (LINC) and Red Hill Valley Parkway (RHVP) were designed and constructed with partial illumination at the exit/entrance ramps and without continuous lighting of the mainline corridors. Lighting at interchanges and cross street overpasses provides additional inadvertent partial illumination in some locations.

The original Environmental Assessments (EA) completed for the LINC and RHVP included a review of lighting. It was identified that through the Red Hill Creek Valley, that lighting would have a detrimental environmental impact and lighting restrictions were imposed. Decisions regarding adding lighting on the LINC and/or RHVP would require renewing and updating the original EAs so that the impacts of lighting could be re-examined. It would be prudent to delay any such EA review so that it may be coupled with other proposed changes such as the widening of the LINC/RHVP to six lanes.

Regardless of the removal of lighting restrictions through a renewal of the EA, physical challenges exist which would inhibit the installation of lighting in some locations. The RHVP bridge over the Red Hill creek was constructed without street light pole bases or conduits and adding lighting on this segment will be challenging as the structure would need to be modified to accommodate these elements.

Further constraints include Hydro One distribution over-head wiring which passes over the RHVP and Mud St/Stone Church interchange requires minimum horizontal and vertical clearances to other structures. These requirements essentially prohibit the installation of street light poles in some locations which could result in difficulties for providing adequate illumination for the mainline and ramps in proximity to the utility corridor.

Lastly, both the LINC and RHVP potentially have some sections where there is limited to no available room to install new street light poles which could negatively impact the ability to provide adequate illumination in these areas.

Excluding the above noted challenges, adding continuous lighting to the LINC and/or RHVP will require capital funding. Preliminary, high level estimates indicate that the cost to install lighting would be in the range of $6M to $10M depending on many factors. Operationally, the installation of lighting on the LINC/RHVP would result in increased annual operational costs of between $100k and $150k. Estimated capital and operating costs do not include enhancing the illumination of the LINC/RHVP exit/entrance ramps which are not currently fully lit. Ramp lighting will add another $1-2M of capital requirements

The Lincoln M. Alexander Parkway (LINC) & Red Hill Valley Parkway (RHVP) Safety Review report PW15091 briefly discussed the safety benefits associated with continuously lighting the LINC and RHVP. The consultant review included a high-level discussion related to lighting. The high-level review is not comprehensive enough to guide any staff recommendations and in order to fully understand the benefits, risks and challenges of adding continuous lighting, a more fulsome review and business analysis would be required to be undertaken. The approximate cost of such a study would be approximately $100k.

INFORMATION REPORT

Hamilton

TO:	Chair and Members Public Works Committee
COMMITTEE DATE:	October 3, 2016
SUBJECT/REPORT NO:	Expansion of Redhill Valley Parkway (RHVP) and Lincoln Alexander Parkway (LINC) – (PW16084) (City Wide) (Outstanding Business List Item)
WARD(S) AFFECTED:	City Wide
PREPARED BY:	Alan Kirkpatrick (905) 546-2424, Extension 4173
SUBMITTED BY: **SIGNATURE:**	John Mater, C.E.T. Director of Corporate Assets & Strategic Planning Public Works Department

Council Direction:

November 11th, 2015

Expansion of Red Hill Valley Parkway and the Lincoln M. Alexander Parkway

(a) That staff be directed to report to the Public Works Committee on the total costs and feasibility to expand the Red Hill Valley Parkway and the Lincoln M. Alexander Parkway from the current four to six lanes;

(b) That the report consider the highway expansion as part of the City's overall Master Transportation Plan; and;

(c) That subject to subsection (a) and with the future support of Council, the Province of Ontario and the Federal Government is approached to cost share in this capital infrastructure project.

Information:

During this review staff from Engineering Services, Traffic Engineering/Operations, Road Operations and Policy and Programs and Finance staff were consulted.

<u>Costs and Feasibility</u>

<u>Feasibility</u>

The Red Hill Valley Parkway (RHVP) and Lincoln M. Alexander Parkway (LINC) could be widened to add an additional lane in each direction throughout the majority of the two highway facilities however there are many factors to consider. Although this widening is feasible, and was considered in the original design, the key problem is the restrictions at the connection points of the Highway 403 and the Queen Elizabeth Way. These facilities (Hwy 403 and QEW) have congestion levels exceeding capacity for the foreseeable future in the extended peak traffic period for the majority of each weekday which will not solve the reported traffic problems on the RHVP and the LINC. Providing extra lanes on the parkway may relieve some of the congestion in the middle sections of the facility, but the excessive congestion at the highway connection points will not be solved with a widening of this roadway infrastructure.

The traffic problems being experienced and anticipated on Highway 403 and the QEW are the key congestion points in this matter. There may be more traffic lanes on the LINC/RHVP for more vehicles, but the vehicles hoping to access the adjacent regional highway network will experience greater congestion and bottlenecks at these connection points because the highways are congested or the access ramps are limited. These conditions will result in continued and worsening back-ups on the parkway facilities, including slower speeds, longer travel time, delays to access the parkway and longer peak traffic periods. This may also lead to motorists exiting the parkways and utilizing City streets to get around congestion.

In addition, widening of the parkways will increase the potential for speeding/accidents in the non-peak periods. Furthermore, with speeding comes the potential for additional noise and public complaints.

Consideration has been given in the past for a Freeway Traffic Management System (FTMS) to be included on the Parkways. This is similar to the cameras and large changeable message boards the MTO utilizes on area highways. The addition of this system provides motorists with travel information to make trip decisions. If the Parkways are considered for widening, it would be recommended that the FTMS be included at an estimated cost of $10 million. Integrating this system with the MTO FTMS would be also explored.

It should also be pointed out that at the Niagara escarpment crossing point on the RHVP; the maximum expansion has been constructed; three (3) upbound lanes plus a truck climbing lane and two (2) down bound lanes. No additional lanes can be provided at this point.

In order to widen the LINC portion of this road network an Environmental Assessment (EA) would be required. The timing of an EA for this type of infrastructure could take approximately two (2) years for the notice of study completion to be finalized. Following that there could be potential Part II Orders (appeals) which would extend the completion of the project. The cost of doing an EA of this magnitude could be in the order of approximately $500,000.

During the EA process different alternatives would need to be reviewed such as high occupancy vehicle (HOV) lanes and road tolling.

The original approval of the EA for the Redhill Valley Parkway allows for the possibility of expansion from the existing four (4) lane facility to six (6) lanes. Aside from the approval, any consideration for widening of the Parkway would require the involvement of the Joint Stewardship Board of the Redhill Valley and a discussion of proposed changes.

In addition to the capital cost to expand the Parkways, operational costs would also increase, i.e. winter control activities, road maintenance. The additional operational costs are estimated to be $596,000 annually.

Prior to undertaking the process to add lanes to the RHVP and LINC, there are a number of steps that should be considered to mitigate the issues as much as possible before undertaking the time and expense to expand the parkway, including:

Improvement	Implementation
Freeway Traffic Management System (FTMS)	Similar to the MTO Compass System for road performance, conditions and incident detection. Provides motorists with information on conditions ahead.
Ramp metering	Controlling the vehicles entering the facility at controlled access points
Speed enforcement	Police presence
Improved Transit	Reducing the number of vehicles on the road
Smart Commute programs and Transportation Demand Management (TDM) Initiatives	Car Pooling, Ride Sharing, Ride matching, Work-shifting strategies, Telecommuting, After-hours delivery programs – increasing ways to reduce the number of vehicles on the road during peak periods

<u>Cost Estimate</u>

The following is a cost estimate range of work in order for infrastructure to be completed.

Action	Redhill Valley Parkway (south side of Redhill Creek bridge at the MTO limit to the north side of the escarpment viaduct bridge)	Lincoln Alexander Parkway (median from Highway 403 limit to the end of the urban section east of Upper Ottawa)
Includes Excavation, Removals, Construction, Traffic Control & protection, Contingency, Engineering Design & Administration	$16,000,000 - $23,000,000	$25,000,000 - $38,000,000
Estimated annual operational costs for road maintenance and winter control	$330,000 Note: Does not include street lighting	$267,000 Note: Does not include street lighting
Environmental Assessment (EA)	EA completed	$500,000

In addition to the capital and operating costs associated with expanding the LINC and RHVP, to include the recommended Freeway Traffic Management System (FTMS) on these highway facilities, and integrating it into the Traffic Operations Centre (TOC), the estimated cost would be $10,000,000

As per the May 20, 2016 Information Update that was prepared for Council, traffic safety improvements for the RHVP and LINC have been initiated and will continue until 2017.

Therefore, expanding the RHVP and LINC is possible at an estimated capital cost range of $41,000,000 to $61,000,000 (excluding street lighting) plus the additional estimated annual operational cost of $597,000. Additional estimated costs of $10,000,000 for an FTMS and $500,000 for an EA on the LINC would be added. This capital cost is currently not in the City's Capital Budget and Forecast. Identification of these costs will be made to senior levels of government if City Council wishes to pursue this matter. The additional lanes, one in each direction, may provide some relief in the centre section of the parkway facilities, however, congested end points, connecting to interregional highways, will potentially result in increased congestion and back-ups on the parkway facilities, which is not the intended outcome, particularly during the weekday peak traffic periods. Other improvements/changes might be considered before expanding the parkway facilities, such as the provision of an FTMS, Ramp metering, increased speed enforcement, increase public transit and other TDM measures.

INFORMATION REPORT

Hamilton

TO:	Chair and Members Public Works Committee
COMMITTEE DATE:	January 16, 2017
SUBJECT/REPORT NO:	Expansion of RHVP and LINC - Traffic Count Feasibility Study (PW16084a) (City Wide) (Outstanding Business List Item)
WARD(S) AFFECTED:	City Wide
PREPARED BY:	Rich Shebib (905) 546-2424, Extension 3909
SUBMITTED BY: SIGNATURE:	Gary Moore, P. Eng. Director, Engineering Services Public Works

Council Direction:

At the October 3, 2016 Public Works Committee meeting staff were directed to report back on the Expansion of the Redhill Valley Parkway (RHVP) and the Lincoln Alexander Parkway (PW16084);

(b) That staff be directed to report back to the Public Works Committee on the feasibility of conducting a detailed traffic study to determine how many cars and commercial vehicles use the Red Hill Valley Parkway (RHVP) and the Lincoln M. Alexander Parkway (LINC) on a daily basis; and,

(c) That the feasibility study include a way to measure vehicle counts on all on-ramps and off-ramps to the RHVP and the LINC;

Information:

(a) Corridor Management currently manages a permanent count station on the RHVP and LINC. These stations provide the total volume, vehicle class, and travel speeds on both of these facilities. A report can be prepared on request.

(b) The cost estimate to conduct Turning Movement Counts at all ramps leading to and from the RHVP and LINC is $7,000 plus HST funded through the Traffic Count Budget. This study can be completed in the spring of 2017.

INFORMATION UPDATE

Hamilton

TO:	Mayor and Members of City Council
DATE:	March 24, 2017
SUBJECT/REPORT NO:	The Lincoln M. Alexander Expressway (LINC) and The Red Hill Valley Parkway (RHVP) Safety Improvements (TRANSP1701) (Wards 4, 5, 6, 7, 8 and 9)
WARD(S) AFFECTED:	Wards 4, 5, 6, 7, 8 and 9
SUBMITTED BY: **SIGNATURE:**	Martin White, C.E.T. Acting Director of Transportation Division Public Works Department Martin White

At the February 27th, 2017 Public Works Committee meeting, staff were requested to provide an update on the short term safety improvements on the Lincoln M. Alexander Expressway (LINC) and the Red Hill Valley Parkway (RHVP) as approved by Council at the December 9th, 2015 meeting. The list of identified short term improvements is attached in Appendix "A" which indicates the recommended improvements and status of each improvement. The medium and long term recommended improvements are attached as Appendix "B", which details the recommended improvements and status.

Should you have any questions on this matter, please contact Martin White, Manager of Traffic Operations and Engineering at extension 4345.

Appendices and Schedules Attached

Appendix A – Short Term Safety Improvements LINC and RHVP
Appendix B – Medium and Long Terms Safety Improvements LINC and RHVP

Copy to:
Chris Murray, City Manager
Dan McKinnon, General Manager, Public Works
Rose Caterini, City Clerk, Corporate Services
Lauri Leduc, Legislative Coordinator, City Clerk, Corporate Services
Mike Zegarac, General Manager, Finance & Corporate Services
Anna Apkarian, Manager of Finance & Administration, Public Works
Andrea McKinney, Director of Communications & Intergovernmental Affairs, City Manager's Office
Jen Recine, Senior Communications Officer, City Manager's Office
Jasmine Graham, Communications Officer, Public Works
Martin White, Manager, Traffic Operations & Engineering, Public Works
David Ferguson, Superintendent of Traffic Engineering
Kim Wyskiel, Superintendent of Traffic Services, Public Works
Kris Jacobson, Superintendent of Traffic Operations, Public Works
Al Kirkpatrick, Manager of Transportation Planning Services, Public Works

Appendix A

Short Term Safety Improvements LINC and RHVP

Short Term Options (0-2 Years)	Status
Trim Vegetation on on-ramps, Queenston Rd. and Barton St.	Completed
Install Oversized Speed Limit Signs	70% Completed-remaining works to be completed spring/summer 2017
Install "Slippery When Wet" Signs	Completion-Spring/Summer 2017
Install "Merge" and "Bridge Ices" Signs	Completion-Spring/Summer 2017
Upgrade Guiderail end treatments	Completed
Install, replace or trim vegetation obscuring signs at Guiderail End Treatments	Completed
Install Digital Feedback Signs	Tender being released-completion in 2017
Install Recessed Pavement Markings from Greenhill to QEW	Works to be completed during resurfacing 2018-2021
Install Object Marker signs on Guiderail End Treatments	Completed
Install Advance Diagrammatic Sign on Rousseaux on-ramp west of Mohawk Road	Completion-Spring/Summer 2017
Conduct Speed Study and Consideration of Variable Speed Limit system	Consultant to be retained in 2017 for study
Install MTO style " Speed Fine" signs	Completion-Spring/Summer 2017
Install Advance sign with Advance Right Lane Exits, Next Lane Exit or Through sign between Hwy 403 and Mohawk Rd.	Completion-Spring/Summer 2017
Conduct Study to Install Queue End Warning Systems	Consultant to be retained in 2017 for study

Appendix B

Medium and Long Terms Safety Improvements LINC and RHVP

Medium Term Options (2-5 Years)	Status
Conduct Pavement Friction Testing	Completed
Shield Rock Cuts between Upper James and Upper Wellington	To be reviewed by Engineering Services

Long Term Options (6+ Years)	Status
Provide Shoulder Rumble Strips along entire length of the LINC	To be completed during re-surfacing
Install Median Barrier System on LINC	To be reviewed and considered during re-surfacing
Install Median Barrier System on RHVP	To be reviewed and considered during re-surfacing
Install End to End Illumination	To be reviewed by Engineering Services

HAMILTON POLICE SERVICES BOARD

- INFORMATION -

DATE:	2017 April 13
REPORT TO:	Chair and Members Hamilton Police Services Board
FROM:	Eric Girt Chief of Police
SUBJECT:	***Five Year Statistical Analysis of Fatal Collisions in Hamilton (PSB 17-057)***

BACKGROUND:

This report was requested by the Board to summarize all Fatal Motor Vehicle Collisions that have taken place within the City of Hamilton, over the past five (5) years and two (2) months. *(2012 – 2016, as well as the first two (2) months of 2017).*

This summary analyzes the stated collisions, giving a breakdown of the basic cause and effect and to establish a commonality; if any, that may exist between the action of the drivers and the resulting fatality.

The scope of this report is based on the basic investigative categories available to the Hamilton Police Service, and, as such, is not intended to be a Traffic Engineering Analysis of all factors that may have contributed to said Collisions and resulting fatalities.

The detailed analytical breakdown, including charts and analysis, is contained in the included **Appendix "A".**

Since 2012, up to and including the first two (2) months of 2017, there have been 83 fatal motor vehicle collisions, in the City of Hamilton, resulting in 90 deaths. Since 2011, up to and including the first two (2) months of 2017, there have been 42 fatal motor vehicle collisions, resulting in 42 deaths on O.P.P. patrolled roadways that are within the boundaries of the City of Hamilton. This totals 125 fatal collisions.

From 2012, up to and including the first two (2) months of 2017, there have been eight (8) fatal motor vehicle collisions on the Lincoln Alexander Expressway (the Linc) and the Red Hill Valley Parkway (RHVP).

Throughout Canada, in 2014 (the most recently available National Statistics) there were 1,667 fatal collisions. Nationally the rate of road fatalities per 100,000 is 5.2, in Ontario that number is 3.5. *(Source: Transport Canada, Canadian Motor Vehicle Traffic Collision Statistics 2014, www.tc.gc.ca/media/documents/roadsafety/cmvtcs2014_eng.pdf).* From 2012-2016, in Hamilton, there were 79 fatal collisions resulting in 86 deaths. The five year averages would equate to 15.8 fatal collisions per year resulting in 17.2 deaths. With an approximate population of 536,930 citizens in Hamilton *(Source: City of Hamilton, www.hamilton.ca/moving-hamilton/community-profile/census-data-hamilton)* this equates to 3.2 deaths per 100,000; lower than both the national and provincial averages.

In conducting this analysis, the Traffic Branch looked at what are commonly referred to as crossover collisions. Crossover collisions occur when a vehicle travelling in one (1) lane of traffic crosses over into the opposing lane of traffic and collide with a vehicle travelling the opposite direction. Due to the opposing forces involved, these types of collisions are often very serious in nature.

It is important to remember that a crossover is a vehicle action, not a contributing factor. The act of the vehicle crossing over may be caused by a contributing factor. Contributing factors are connected to driver behaviour, vehicle actions are the result of driver behaviour.

During the stated time frames there were ten (10) crossovers on HPS patrolled roadways, and six (6) crossovers on OPP patrolled roadways. These crossovers account for 12% of HPS fatal collision types and 14% of OPP fatal collision types. For the Linc/RHVP, during this time frame, there were four (4) crossovers accounting for 50% of fatal collision types on that roadway. It is worth noting that while 50% is indeed a much higher percentage; the numbers examined are much smaller resulting in far greater percentage changes.

From the analysis of fatal collisions occurring on HPS patrolled roadways the three (3) most common contributing factors are driver inattention - 48%, intoxicating substances (alcohol & drugs) - 31%, and speed - 32%. These numbers will add up to more than 100% due to the presence of multiple contributing factors in some collisions. There are also additional contributing factors identified in Appendix "A". It is worth noting that these numbers are separate from the previously discussed crossover numbers. As previously mentioned, a crossover is a vehicle action; not a contributing factor, which is part of driver behaviour.

For collisions on OPP patrolled roadways within Hamilton borders, the three (3) most common contributing factors are also driver inattention - 45%, intoxicating substances (alcohol & drugs) - 9.5%, and speed - 9.5%. There are additional contributing factors which are identified in Appendix "A". When looking at the Linc/RHVP, a similar trend is apparent with the three (3) most common contributing factors once again being driver inattention - 25%, intoxicating substances (alcohol & drugs) - 25% and speed - 37.5%. Again the numbers relating to the Linc/RHVP are small comparatively and, as such, caution should be exercised in drawing conclusions.

The attached **Appendix "A"** provides a full breakdown of all the numbers, including analysis and charts to add clarity.

After a review of the past 64 months, (from the beginning of Jan 2012 to the end of Feb 2017), there is no single common factor in all Fatal Motor Vehicle Collisions. However, based on the results of the review we can see; based on the balance of probability, that excessive speed, intoxicating substances (alcohol and drugs) and inattentiveness are the most frequent factors present in fatal collisions.

The Hamilton Police Service continues to work to minimize these factors through a combination of education and enforcement. Education takes place through our school officers, our Media and Corporate Communications office and in partnership with the Hamilton Strategic Road Safety Committee. Where education is not effective, the Hamilton Police Service conducts strategic enforcement to attempt to change driver behaviour and reduce collisions.

Eric Girt
Chief of Police

EG/W. Mason
Attachment: *Appendix "A"*

cc: Deputy Chief Ken Weatherill, Field Support
Superintendent Will Mason, Support Services

PSB 17- 057 Appendix "A"

Five Year Statistical Analysis:

(2012 – 2016 + the first two months of 2017 {Jan & Feb})

Of All Fatal Motor Vehicle Collisions

Occurring within the City of Hamilton

Under the jurisdiction of the Hamilton Police Service

Conducted by the Support Services Division

P.C. W. Johnston #578

Traffic Office

"April 2017"

Index

Five Year Statistical Analysis.

(2012 – 2016 + the first two months of 2017 {Jan & Feb})

Of All Fatal Motor Vehicle Collisions

Occurring within the City of Hamilton

Under the jurisdiction of

The Hamilton Police Service

Conducted by:

Support Services Division

Traffic Office

"April 2017"

Five Year Analysis:

(2012 – 2016 + the first two months of 2017)

Of All Fatal Motor Vehicle Collisions

Occurring within the City of Hamilton

Under the jurisdiction of the Hamilton Police Service.

Methodology:

In reviewing the stated Collisions the following criteria will be examined, location of collision, type of collision, actions of the offending involved party, if a vehicle "crossover" was part of the collision, external contributing factors, number of deceased persons and the locations of the deceased parties.

This report is intended to give a brief overview of what transpired to cause the collisions and to give an insight into what the extenuating contributing factors that may have been in play to cause a resulting fatality.

The following chart will give a summation of how many motor vehicle collisions occurred in each particular time period.

Fatality Chart for the last 5+ years.

Year	# of Fatal MVC's	# of Deceased Parties	Deceased Driver of Veh's.	Deceased Passengers	Deceased Pedestrians	Deceased Cyclist
62 month Total =	83	90	43	15	30	2
Total (2012 to 2016 only)	*79*	*86*	*39*	*15*	*30*	*2*
5 year Average (2012 to 2016 only)	*16*	*17*	*8*	*3*	*6*	*0*

From figures contained in the stated chart, the average number of Fatal Collisions over the past 5 complete years is 16, resulting in 17 Fatalities.

Fatality Chart & Contributing Factors for the last 5+ years:

Year	# of Fatal MVC's	# of Deceased Parties	More than one category may apply to the Fatal Collision.							
			Speed	Intoxicating Substances (Alcohol & Drugs.)	Cross-over	Inattentive	Unknown	Med. Condition	Age	Weather
62 month Total =	83	90	27	26	10	40	11	6	3	1
Total (2012 to 2016 only)	*79*	*86*	*25*	*24*	*8*	*38*	*11*	*6*	*3*	*1*
5 year Average (2012 to 2016 only)	*16*	*17*	*5*	*5*	*2*	*8*	*2*	*1*	*1*	*0*

From figures contained in the stated chart, the three most common contributing factors to a Fatal Collision are Speed, Intoxicating Substances and Inattentiveness.

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RHV0001045

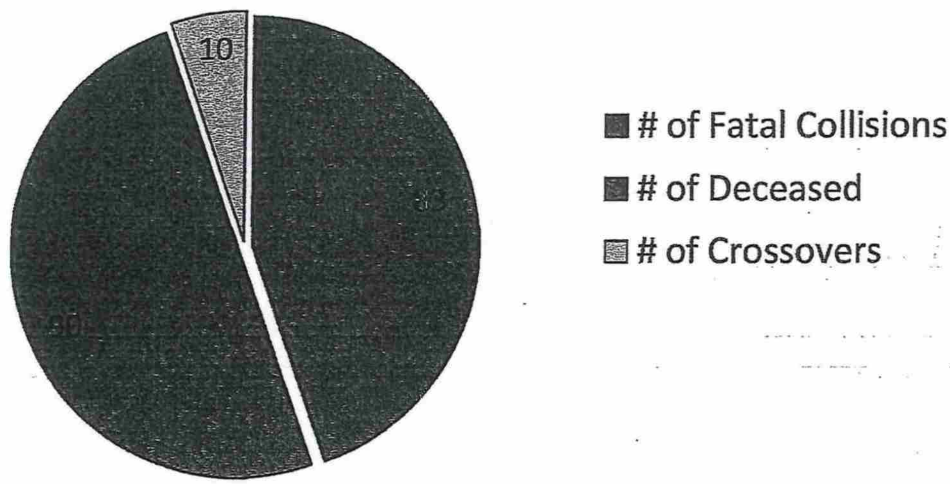
On average (5 yr. period) per year, Speed will be a contributing factor in 5 collisions, Intoxicating Substances will be a contributing factor in 5 Collisions and Inattentiveness will be a factor in 8 Collisions.

It is not surprising that the three contributing factors mentioned above are the root cause of Fatal Motor Vehicle Collisions over the past five years, are again the front runners in the present year of 2017.

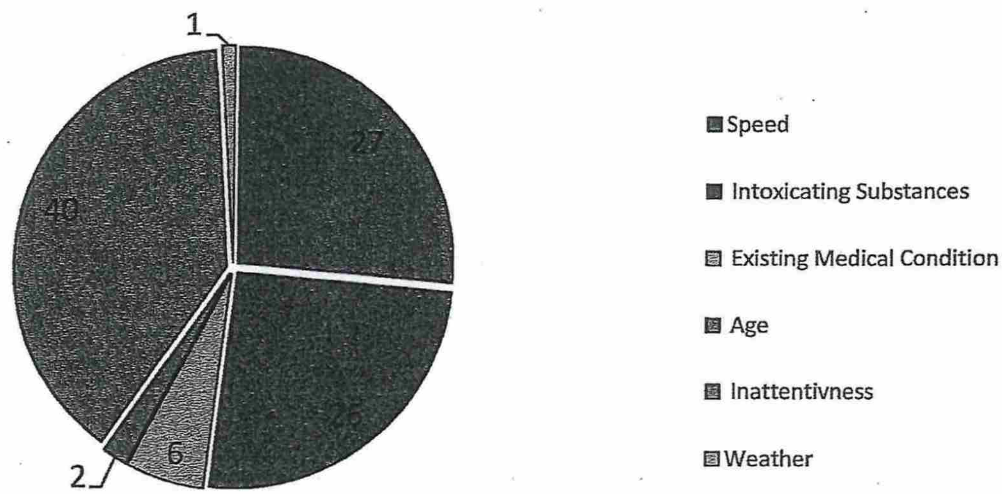
The following charts and graphs are a representation of the specified data:

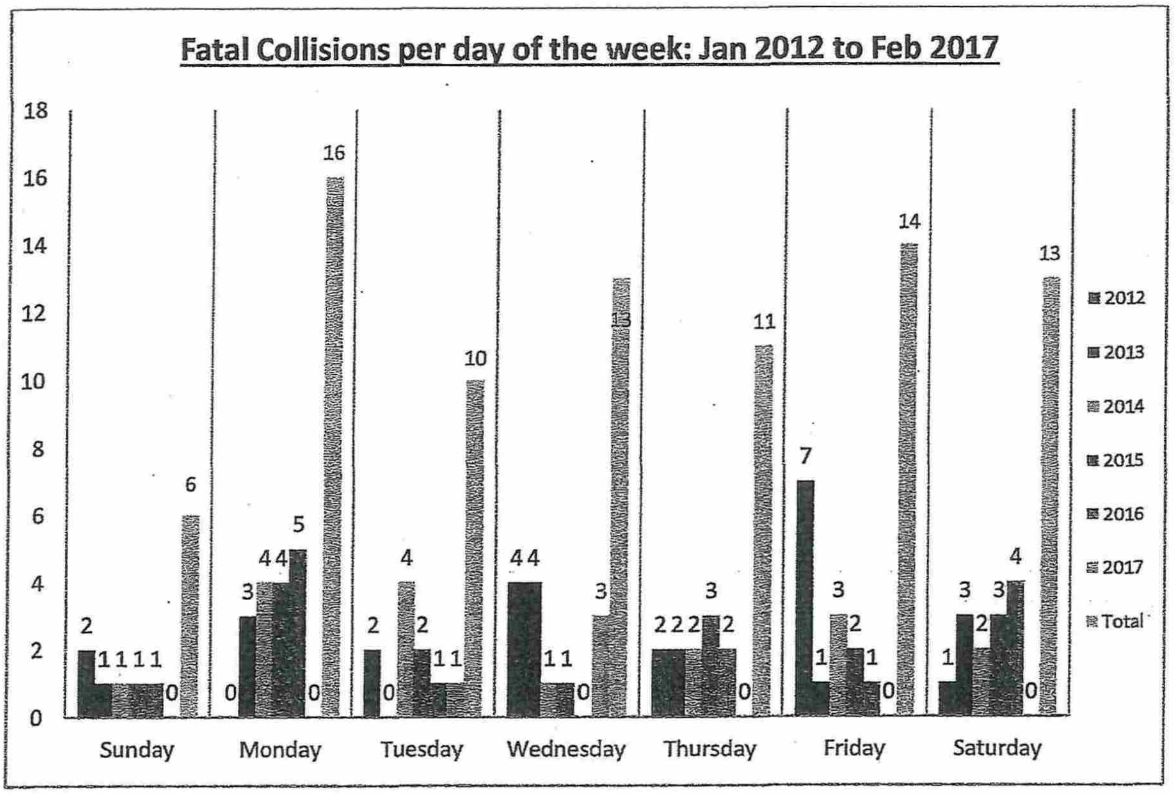
- Total # of Fatal Collisions from Jan 2012 to Feb 2017: & resulting Fatalities.
- Total # of Fatal Collisions from Jan 2012 to Feb 2017 = 83
  and the contributing factors that are associated to or contributed to said collisions.
- Fatal Collisions per day of the week: Jan 2012 to Feb 2017
- The Number of Fatal Collisions per day of the week
  for the past 62 Months: Jan 2012 to Feb 2017
- Fatal Collisions (83): From Jan 2012 to Feb 2017
  per time of day.
- Fatal Collisions (83): the number for each stated time period
  Jan 2012 to Feb 2017

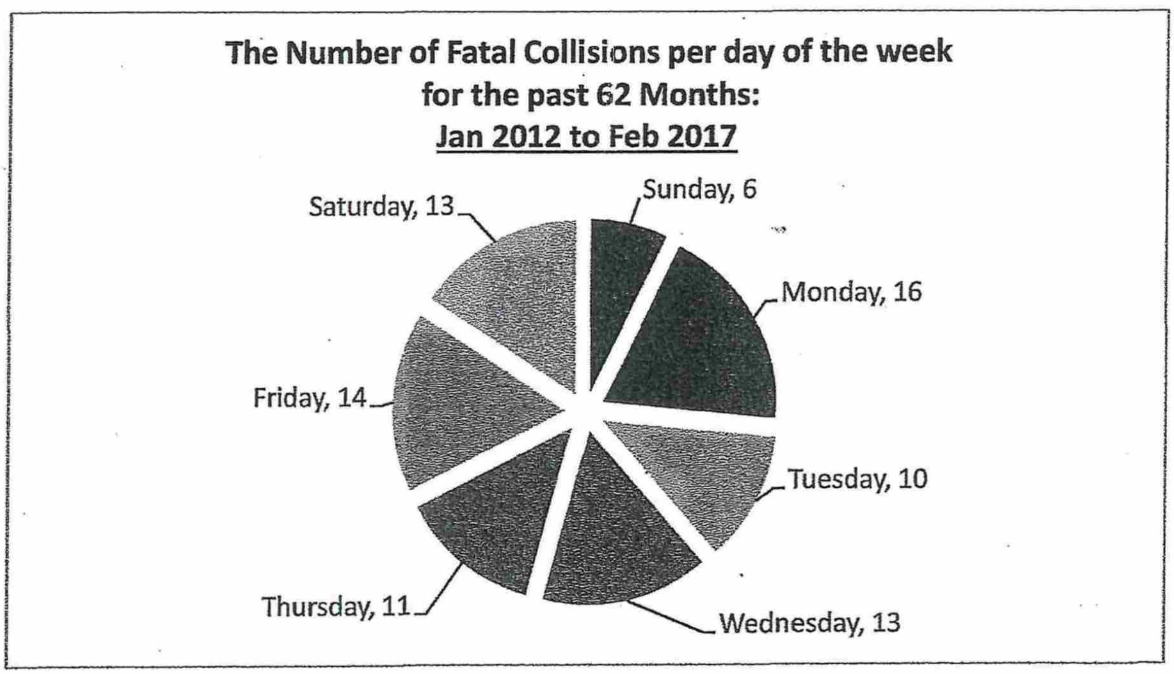
Total # of Fatal Collisions from Jan 2012 to Feb 2017: & resulting Fatalities.



Total # of Fatal Collisions from Jan 2012 to Feb 2017 = 83
And the contributing factors that are associated to or contributed to said collisions.







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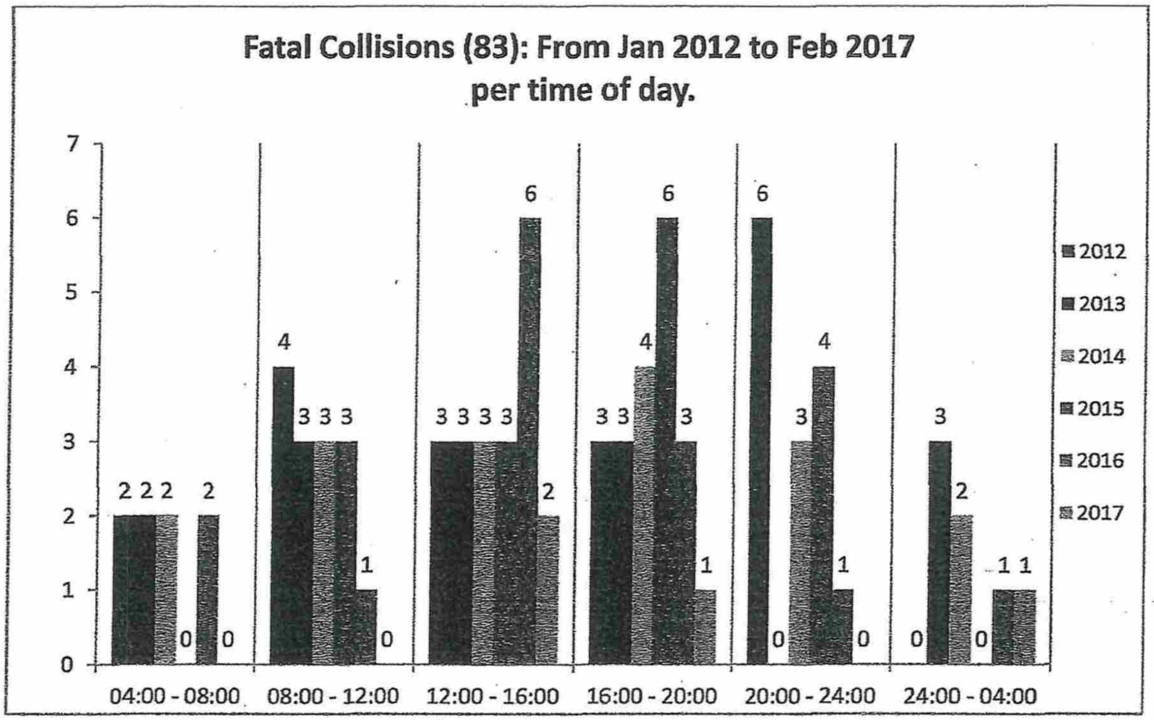
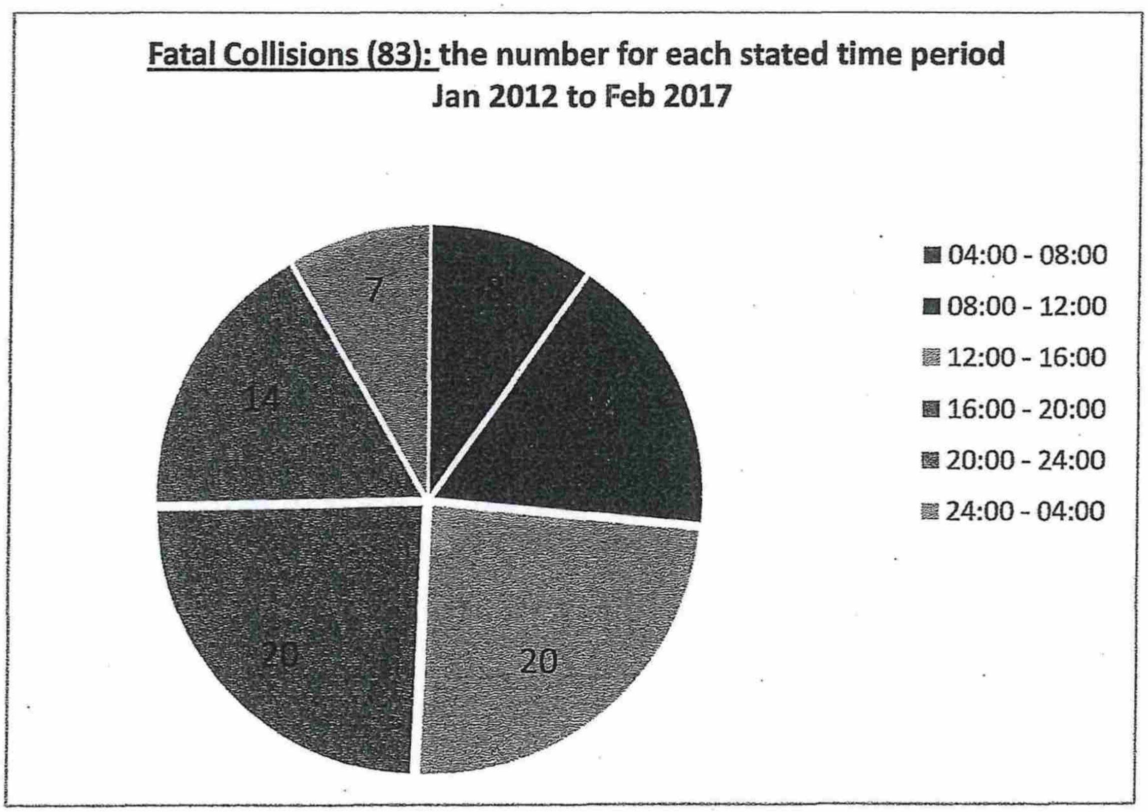
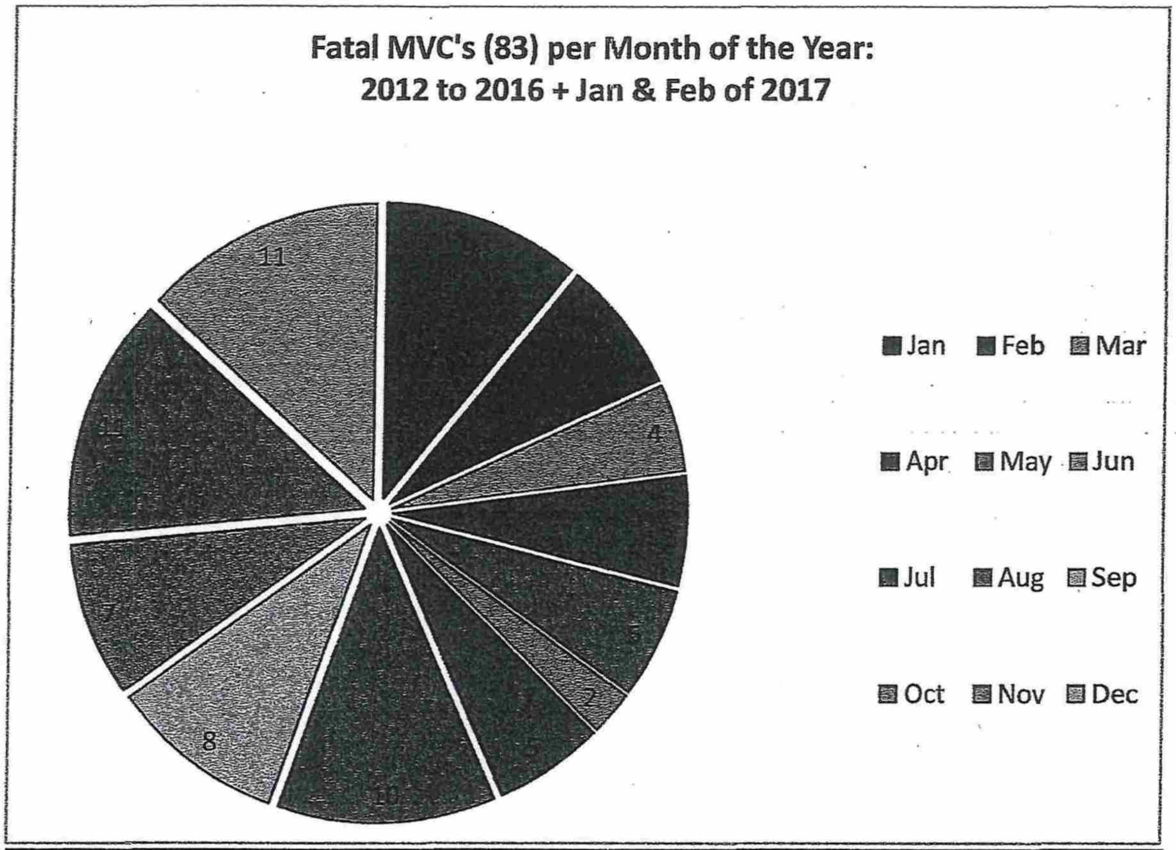

Fatal Collisions (83): From Jan 2012 to Feb 2017
per time of day.
2012
2013
2014
2015
2016
2017
04:00 - 08:00
08:00 - 12:00
12:00 - 16:00
16:00 - 20:00
20:00 - 24:00
24:00 - 04:00

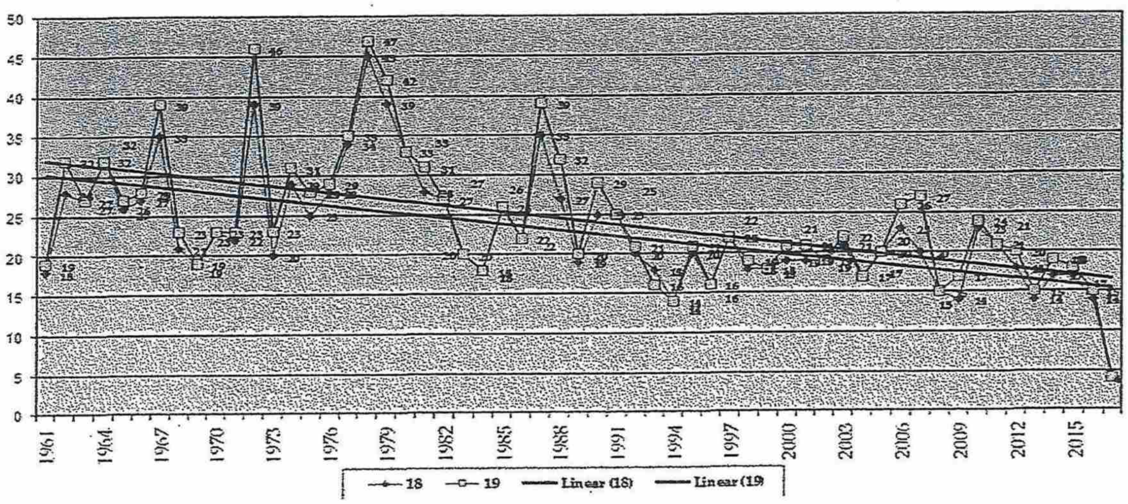

Fatal Collisions (83): the number for each stated time period
Jan 2012 to Feb 2017
04:00 - 08:00
08:00 - 12:00
12:00 - 16:00
16:00 - 20:00
20:00 - 24:00
24:00 - 04:00
7
14
20
20

The following Chart shows the Month of the year when each Fatal M.V.C. (83)... took place, given the time period of 2012 to 2016 + the first two months of 2017 (Jan & Feb).

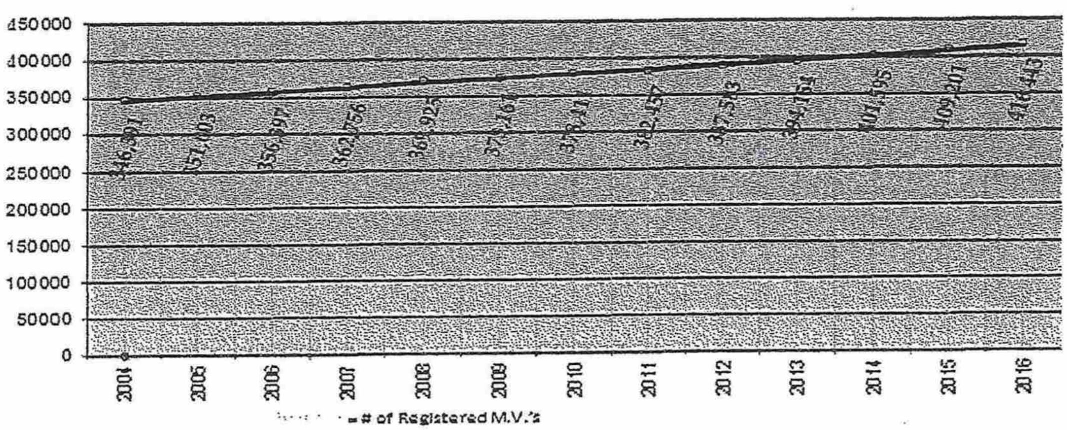


The two charts contained below are good representations of how Fatal Motor Vehicle Collisions have declined in the City of Hamilton over the past 60 years, even though the number of registered Motor Vehicles within the City of Hamilton has increased dramatically.

Fatalities For Previous 60 Years



Number of Registered M.V.'s
(Passenger, M/C, Moped, Commercial, Bus & Trailer)
in Hamilton for the stated Years (M.T.O.)



Ontario Provincial Police Collision Data (Fatal Collision):

The Burlington O.P.P. are responsible for patrolling the following Highways within the geographical boundaries of the City of Hamilton, that being the QEW, Highway #403, Highway #8, Highway #6 and Highway #5.

The following Chart depicts how many Fatal Motor Vehicle collisions have occurred on their roadways since January 2011 till the end of Feb 2017, and the resulting Fatalities.

Year	# of Fatal Collisions	# of Fatal Injuries
2011	8	8
2012	4	4
2013	8	8
2014	5	5
2015	9	9
2016	8	8
2017	2	2

However…the cause and effect per collision was not been broken down by year but has been represented as a collective total for the years 2011 to 2016, and as such are presented below:

Careless	= 16 Fatal Collisions
Medical	= 4 Fatal Collisions
Speed	= 4 Fatal Collisions
Alcohol	= 3 Fatal Collisions
Drug	= 1 Fatal Collision
Pedestrian	= 5 Fatal Collisions
Distraction	= 1 Fatal Collision
Mech. Malfunction	= 2 Fatal Collisions
Crossover	= 6 Fatal Collisions
Total	**= 42 Fatal Collisions**

In regards to the stated Highways patrolled by the Burlington O.P.P. those being the QEW, Highway #403, Highway #8, Highway #6 and Highway #5 the following numbers of Fatalities have occurred on each Highway.

QEW	= 19 Fatalities
Highway #403	= 9 Fatalities
Highway #8	= 1 Fatality
Highway #6	= 11 Fatalities
Highway #5	= 2 Fatalities
Total Fatalities	= 42 Fatalities

Upon review of the statistics supplied by the O.P.P. Burlington Detachment, it would appear that yet again the three main factors at play with driver behavior are:

Speed (4), Intoxicating Substances (4), and Inattentiveness (17).

2011 – 2016 Fatal Stats for Burlington OPP by Month

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
# of Fatal Collisions	5	1	5	1	5	0	4	4	1	7	5	4

2011 – 2016 Fatal Stats for Burlington OPP by Day

Day of the Week	Sun	Mon	Tue	Wed	Thu	Fri	Sat
# of Fatal Collisions	6	6	5	4	7	8	6

2011 – 2016 Fatal Stats for Burlington OPP by Hour

Hours	20:00 – 24:00	16:00 – 20:00	12:00 – 16:00	08:00 – 12:00	04:00 – 08:00	00:00 – 04:00
# of Fatal Collisions	9	12	7	2	6	6

The Red Hill Valley Parkway & the Lincoln M. Alexander Parkway Evaluation.

Special Analysis of Five Year Fatal Trend on these two Specific Roadways.

*The Lincoln M. Alexander Parkway: **Over View.***

- 4 Lane divided expressway opened in 1997
- 90 km/hr. posted speed limit
- Approx. 10km in length
- Connects highway #403 to the Red Hill Valley Parkway.
- Includes six full access interchanges.
- Volume count on stated roadway approx. 81,266 Veh's per day

*The Red Hill Valley Parkway: **Over View.***

- 4 Lane divided expressway opened in 2007
- 90 km/hr. posted speed limit
- Approx. 7km in length
- Connects the QEW to the Lincoln M. Alexander Parkway
- Includes six full access interchanges.
- Volume count on stated roadway approx. 69,801 Veh's per day

In total these two roadways account for approx. 17 km of roadway that is essential to the economic growth and the sustainability of the City of Hamilton. Over the past five years (2012 to 2016) there have been six fatal motor vehicle collisions and in the first two months of 2017 there have been two fatal motor vehicle collisions, giving a grand total of eight fatal motor vehicle collisions.

Cause and Effect of the stated Collisions :.(for stated time period)

The following charts break down the most common contributing factors to each fatal collision, and give an overview of the location, type of vehicles involved in the collisions and the number and locations of deceased persons.

The crossover category has been added to pinpoint a contributing factor that may be unique to the stated roadways.

Fatality Chart & Contributing Factors for the Red Hill Valley Parkway & the Lincoln M. Alexander Parkway.

For the last 5 years:

Year	# of Fatal MVC's	# of Deceased Parties	Deceased Driver of Veh's.	Deceased Passengers	Deceased Pedestrians	Deceased Cyclist
62 month Total =	8	11	7	4	0	0
Total (2012 to 2016 only)	*6*	*9*	*5*	*4*	*0*	*0*
5 year Average (2012 to 2016 only)	*1.2*	*1.8*	*1.0*	*0.8*	*0*	*0*

From figures contained in the stated chart, the average number of Fatal Collisions over the past 5 complete years is 1.2 collisions resulting in 1.8 Fatalities.

Rounding off the above mentioned numbers we get two Collisions resulting in two fatalities.

Fatality Chart & Contributing Factors for the Red Hill Valley Parkway & the Lincoln M. Alexander Parkway:

For the last 5 years:

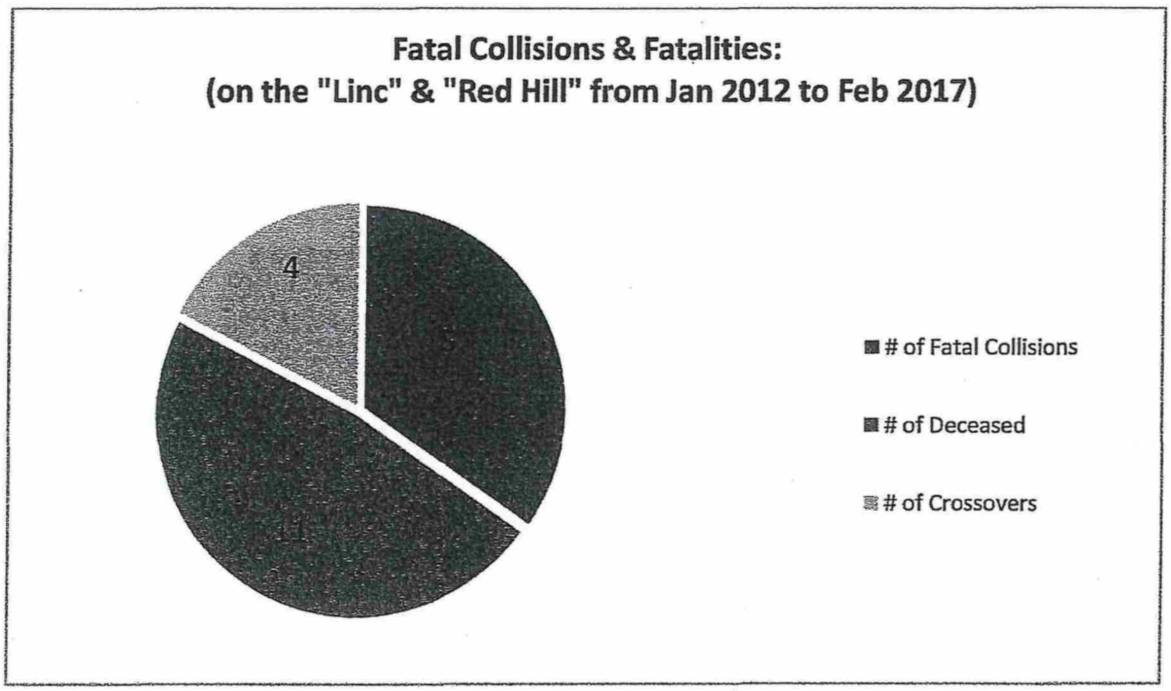
			More than one category may apply to the Fatal Collision.							
Year	# of Fatal MVC's	# of Deceased Parties	Speed	Intoxicating Substances (Alcohol & Drugs.)	Cross-over	Inattentive	Unknown	Med. Condition	Age	Weather
62 month Total =	8	11	3	2	4	2	2	1	0	1
Total (2012 to 2016 only)	*6*	*9*	*2*	*1*	*2*	*1*	*2*	*1*	*0*	*1*
5 year Avg. (2012 to 2016 only)	*1.2*	*1.8*	*0.4*	*0.2*	*0.4*	*0.2*	*0.4*	*0.2*	*0*	*0.2*

From figures contained in the stated chart, the three most common contributing factors to a Fatal Collision is Speed, Intoxicating Substances and Inattentiveness.

It is not surprising that the three contributing factors mentioned above are the root cause of Fatal Motor Vehicle Collisions over the past five years, are again the front runners in this present year 2017.

Fatality Chart for the Red Hill Valley Parkway & the Lincoln M. Alexander Parkway.

For the last 62 months:



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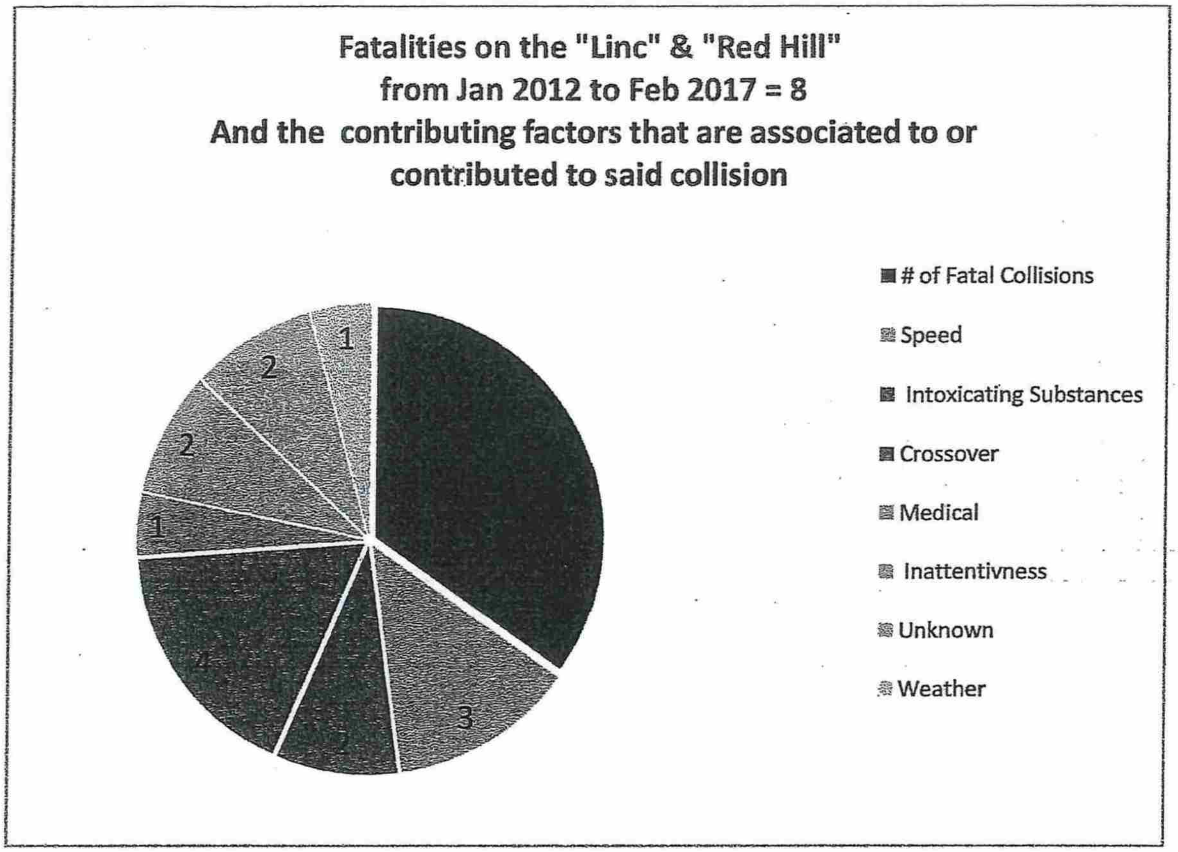
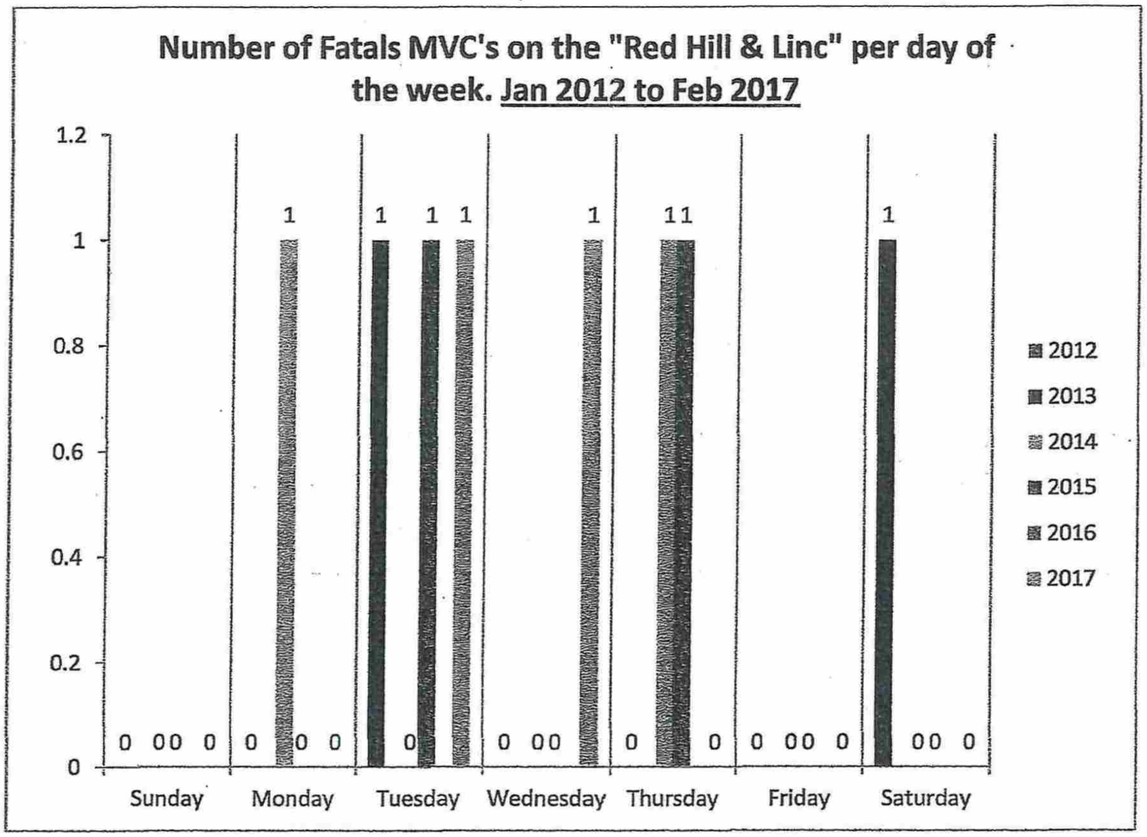
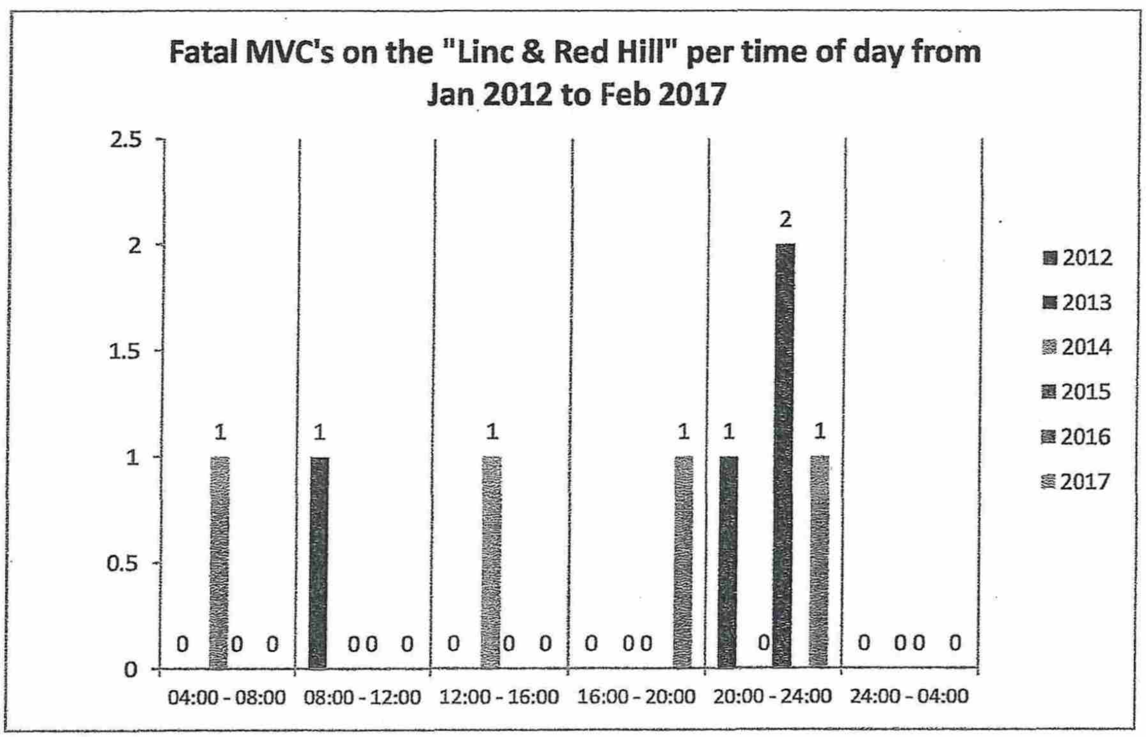
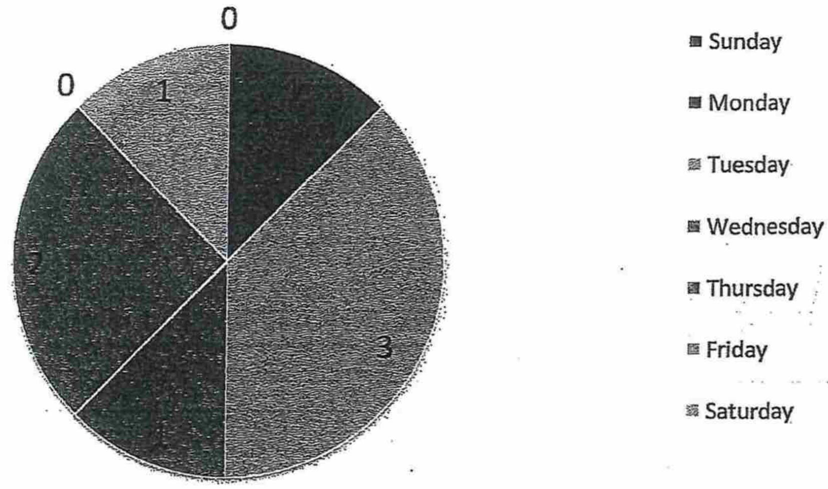

Fatalities on the "Linc" & "Red Hill"
from Jan 2012 to Feb 2017 = 8
And the contributing factors that are associated to or contributed to said collision
# of Fatal Collisions
Speed
Intoxicating Substances
Crossover
Medical
Inattentivness
Unknown
Weather
3
2
4
1
2
2
1

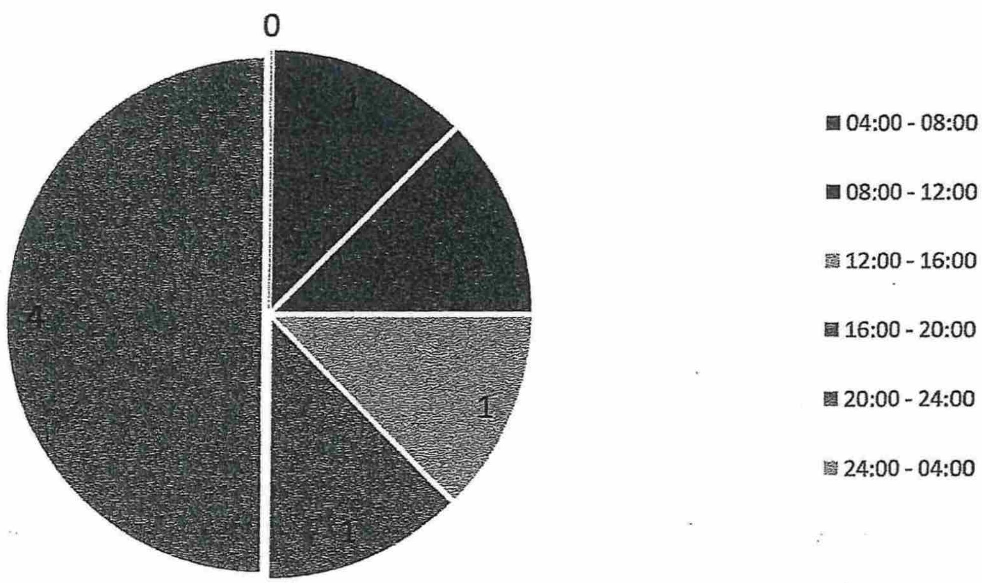

Number of Fatals MVC's on the "Red Hill & Linc" per day of the week. Jan 2012 to Feb 2017
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
2012
2013
2014
2015
2016
2017


Fatal MVC's on the "Linc & Red Hill" per time of day from Jan 2012 to Feb 2017
04:00 - 08:00
08:00 - 12:00
12:00 - 16:00
16:00 - 20:00
20:00 - 24:00
24:00 - 04:00
2012
2013
2014
2015
2016
2017

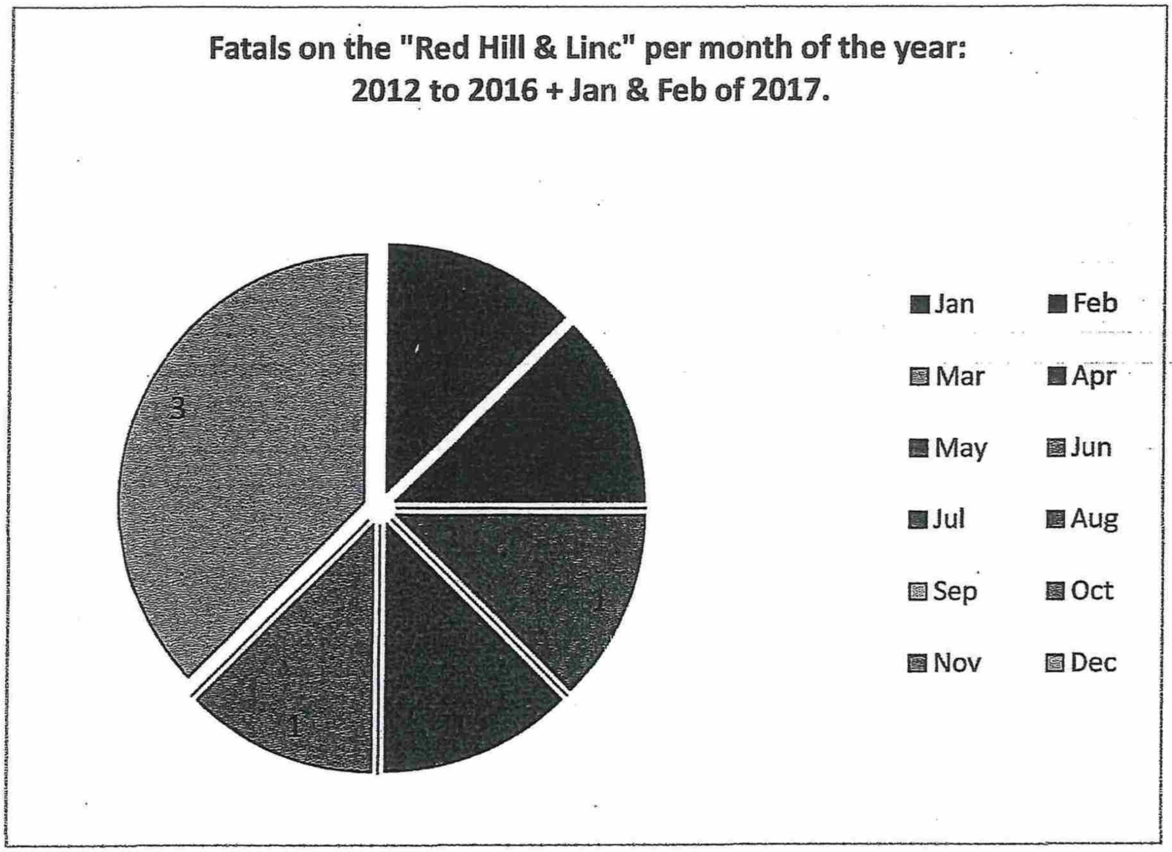
Fatalities on the "LINC & Red Hill" for the Past 62Month (Jan 2012 to Feb 2017) Day of the week in which they occurred.



Fatalities on the "Linc & Red Hill" for the past 62 Months. Jan 2012 to Feb 2017 as per the time of Day they occurred.



The following Chart shows the Month of the year when each Fatal M.V.C. (8)... took place, on the "Red Hill & Linc." given the time period of 2012 to 2016 + the first two months of 2017 (Jan & Feb).



INFORMATION UPDATE

Hamilton

TO:	Mayor and Members of City Council
DATE:	May 19, 2017
SUBJECT/REPORT NO:	LINC/RHVP Safety Improvements
WARD(S) AFFECTED:	Wards 4, 5, 6, 7, 8 and 9
SUBMITTED BY: SIGNATURE:	John Mater Director of Transportation Services Public Works Department

At the February 27th, 2017 Public Works Committee meeting, staff were requested to provide an update on the short term safety improvements as approved by Council at the December 9th, 2015 meeting. The list of identified short term improvements is attached in Appendix "A" which indicates the recommended improvements, estimated cost and status of each in initiative. The medium and long term recommended improvements are attached as Appendix "B", which details the recommended improvements, cost and status.

Public Works Committee also requested information regarding the number of fatalities that have occurred since the opening of the Lincoln Alexander Expressway (LINC) in the fall of 1997 and Red Hill Valley Parkway (RHVP) in the fall of 2007. A breakdown of the yearly fatalities can be found in Appendix "C". There have been a total of 6 collisions on the LINC and 4 collisions on the RHVP that resulted in fatalities (data up to December 31, 2016).

Staff also conducted an assessment of traffic volumes on both facilities. Since the opening of the LINC in October 1997 the average volume has increased from approximately 48,000 vehicles per day (vpd) to 85,000 vpd. in 2015 (77% increase). A large part of the increase can be attributed to the opening of the RHVP in 2007 which created a continuous connection from Highway 403 to the QEW. Since the opening of the RHVP in November 2007 the average volume has increased from 49,000 vpd to 57,000 vpd. in 2015 (16% increase).

When reviewing roadways to determine a volume/capacity ratio, multiple considerations are taken into consideration including, operating speed, lane width, number of lanes, facility type, etc. In reviewing the facilities, it is estimated that both roadways operate with a volume/capacity of 2000 vehicles per hour/lane. This would mean that under ideal conditions, the maximum volume that can be handled by the roadways would be in the area of 95,000 to 100,000 vehicles per day.

This would appear to be the case, as both roadways operate efficiently outside of the Peak Period time periods. As a result of the peak period volumes, it is estimated that the v/c ratio is close to 1.0 which would identify a Level of Service D for both roadways. During periods of time not within the Peak Periods, both facilities operate more in a free flow condition, with minimal to no delay. During these time periods, the facilities operate at a level of service A or B.

Should you have any questions, please feel free to contact Martin White, Manager of Traffic Operations and Engineering at extension 4345.

Copy to:
Chris Murray, City Manager
Dan McKinnon, General Manager, Public Works
Rose Caterini, City Clerk, General Manager's Office
Lauri Leduc, Legislative Coordinator, General Manager's Office
Mike Zegarac, General Manager, Finance & Corporate Services
Anna Apkarian, Manager of Finance & Administration, Public Works
Andrea McKinney, Director of Communications & Intergovernmental Affairs, City Manager's Office
Jen Recine, Senior Communications Officer, City Manager's Office
Jasmine Graham, Communications Officer, Public Works
John Mater, Director of Transportation Management, Public Works
David Ferguson, Superintendent of Traffic Engineering

Appendix A

Short Term Options (0-2 Years)	Estimated Cost ($)	Status
Trim Vegetation on on-ramps, Queenston Rd. and Barton St.	$3,000	Completed
Install Oversized Speed Limit Signs	$7,000	70% Completed- remaining works to be completed spring/summer 2017
Install "Slippery When Wet" Signs	$8,000	Completion- Spring/Summer 2017
Install "Merge" and "Bridge Ices" Signs	$3,000	Completion- Spring/Summer 2017
Upgrade Guiderail end treatments	$70,000	Completed
Install, replace or trim vegetation obscuring signs at Guiderail End Treatments	$3,500	Completed
Install Digital Feedback Signs	$100,000	Tender being released- completion in 2017
Install Recessed Pavement Markings from Greenhill to QEW	$247,000	Works to be completed during resurfacing 2018- 2021
Install Object Marker signs on Guiderail End Treatments	$3,500	Completed
Install Advance Diagrammatic Sign on Rousseaux on-ramp west of Mohawk Road	$3,000	Completion- Spring/Summer 2017
Conduct Speed Study and Consideration of Variable Speed Limit system	$40,000	Consultant to be retained in 2017 for study
Install MTO style " Speed Fine" signs	$10,000	Completion- Spring/Summer 2017
Install Advance sign with Advance Right Lane Exits, Next Lane Exit or Through sign between Hwy 403 and Mohawk Rd.	$4,000	Completion- Spring/Summer 2017
Conduct Study to Install Queue End Warning Systems	$40,000	Consultant to be retained in 2017 for study
Total Cost	$542,000	
Total Cost with 25% Contingency	$677,500	

Appendix B

Medium Term Options (2-5 Years)	Estimated Cost $	Status
Conduct Pavement Friction Testing	$40,000	Completed
Shield Rock Cuts between Upper James and Upper Wellington	$241,590	To be reviewed by Engineering Services
Total Cost	$281,590	
Total Cost with 25% Contingency	$351,988	

Long Term Options (6+ Years)	Estimated Costs $	Status
Provide Shoulder Rumble Strips along entire length of the LINC	$105,000	To be completed during re-surfacing
Install Median Barrier System on LINC	$5,569,000	To be reviewed and considered during re-surfacing
Install Median Barrier System on RHVP	$2,528,400	To be reviewed and considered during re-surfacing
Install End to End Illumination	$810,000	To be reviewed by Engineering Services
Total Cost	$9,012,400	
Total Cost with 25% Contingency	$11,265,500	

Appendix C

Fatal collisions on the LINC

Year	Number of Fatal Collisions
1997	0
1998	0
1999	1
2000	0
2001	0
2002	0
2003	0
2004	0
2005	2
2006	0
2007	0
2008	0
2009	1
2010	0
2011	0
2012	1
2013	0
2014	1
2015	0
2016	0

Fatal collisions on RHVP

Year	Number of Fatal Collisions
2007	0
2008	1
2009	0
2010	0
2011	0
2012	1
2013	0
2014	0
2015	2
2016	0

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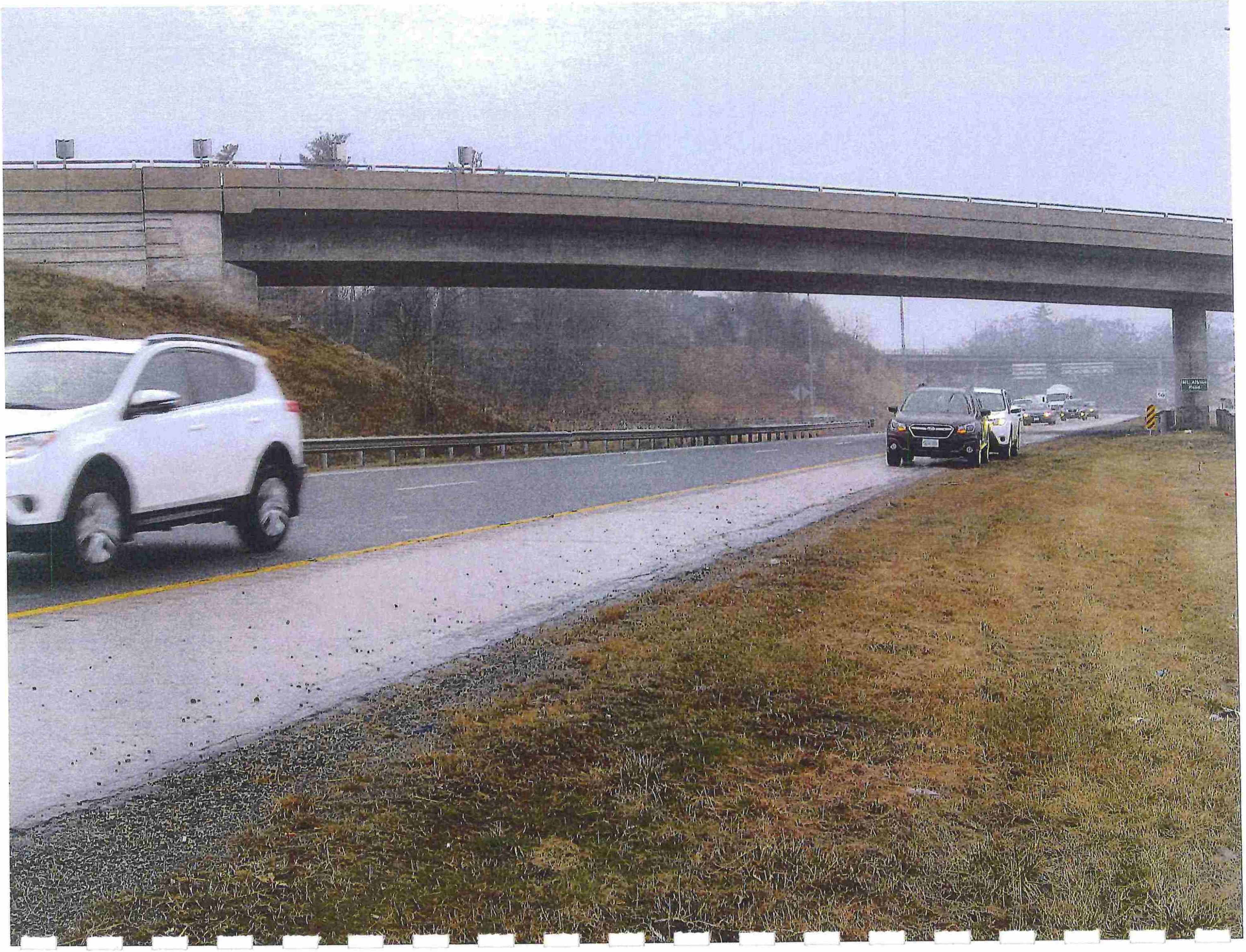

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RHV0001045

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RHV0001045

HAM0064440_0001
RHV0001045


Mt. Albion
Road
90

HAM0064440_0001
RHV0001045

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RHV0001045

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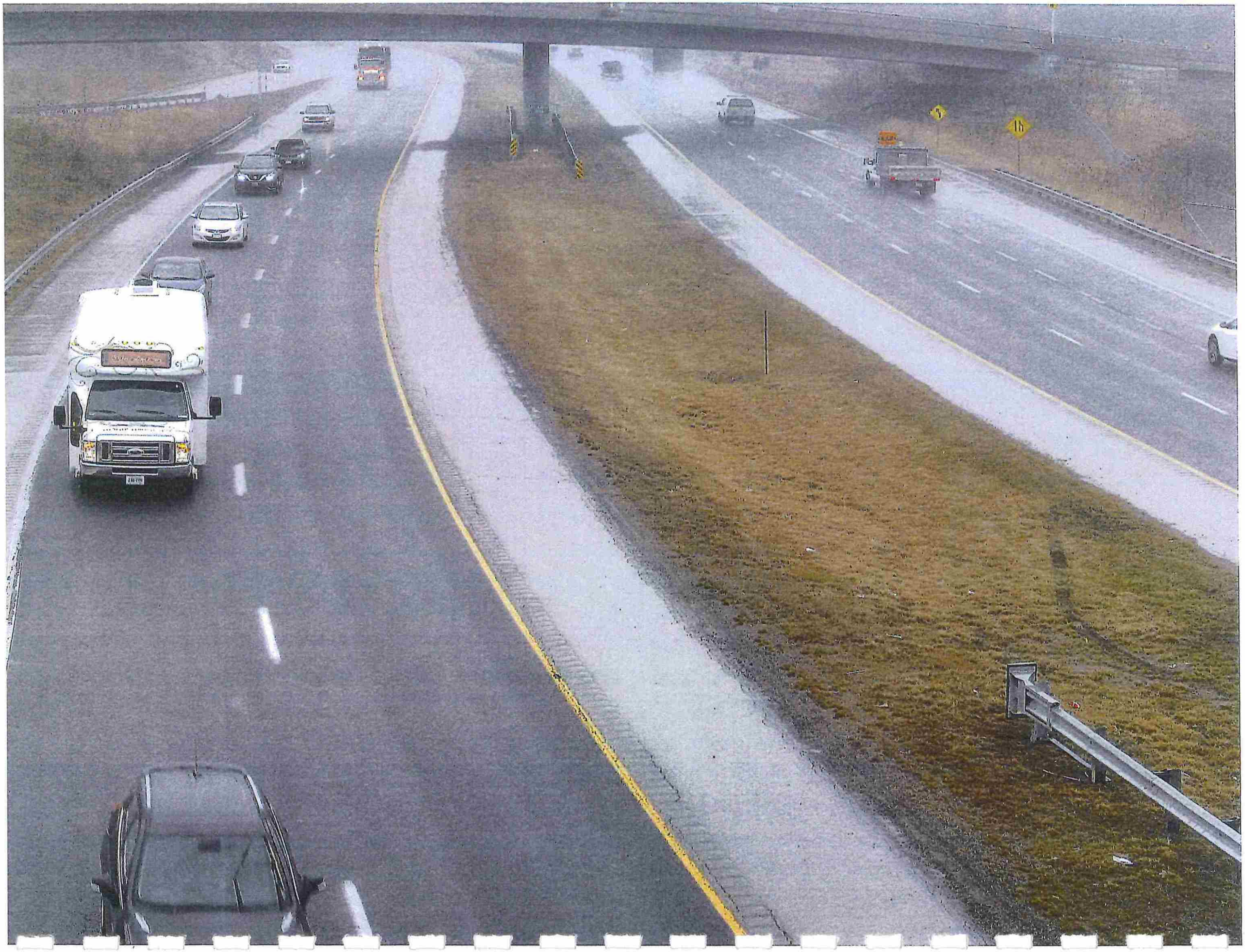
RHV0001045



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RHV0001045

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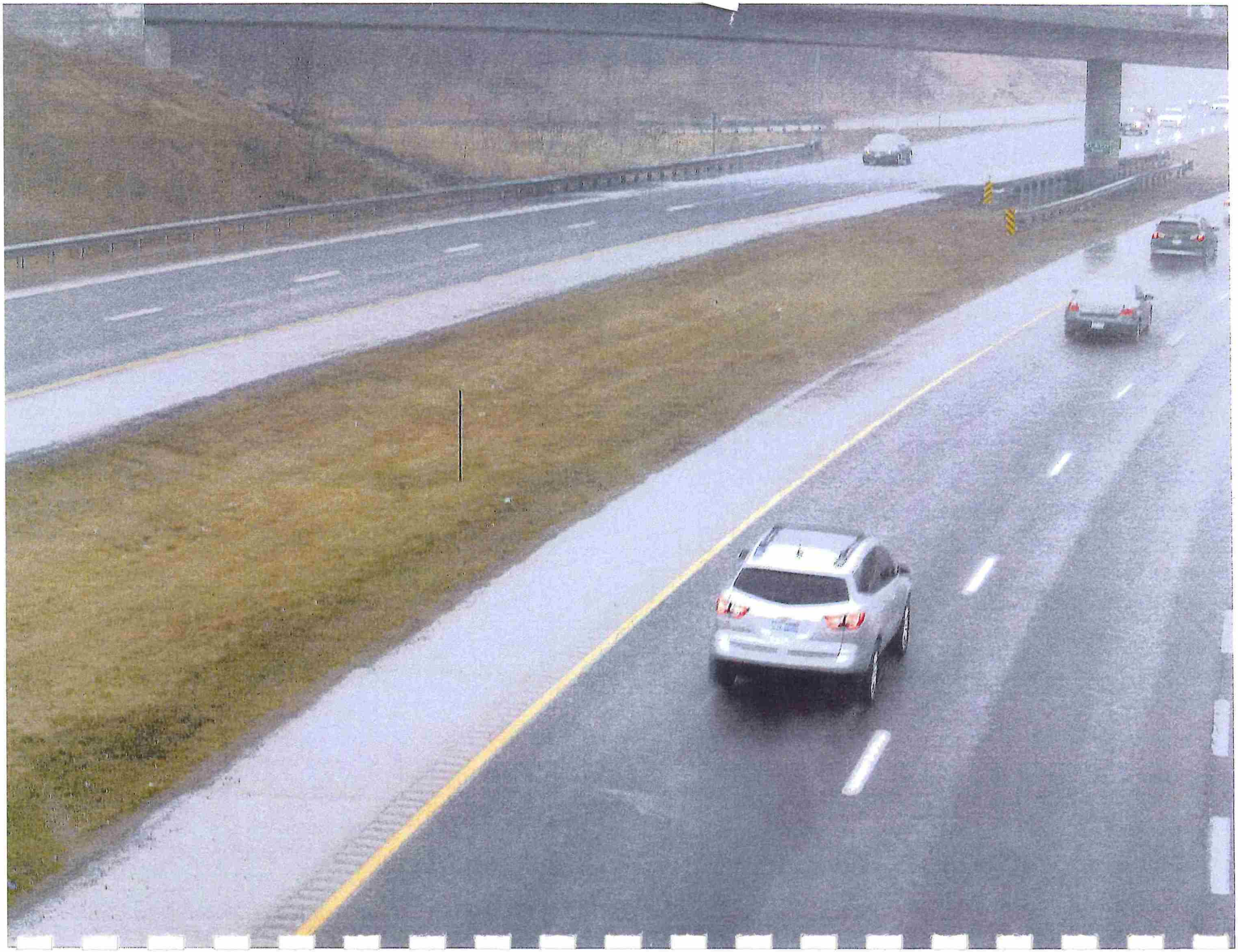
RHV0001045



SCHEDULE "B"

Documents that are or were in the corporation's possession, control or power that it objects to producing on the grounds of privilege.

(a) **Solicitor-Client Privilege:** Documents containing confidential professional communications passing between the defendant, or the defendant's agent and the defendant's legal advisers directly related to the seeking or receiving of legal advice or legal assistance.

> All correspondence and communications between Legal Services Division and other divisions within the municipal corporation of the City of Hamilton. The said documents consist of professional communications of a confidential nature passing between the corporation's solicitors and its agents in anticipation of or during the progress of actual litigation, for the purposes of asking for and receiving legal advice or for the dominant purpose of aiding in the conduct of actual or anticipated litigation, which litigation was reasonably contemplated at the time of making of the said documents. (**Solicitor and Client Privilege**)

(b) **Litigation Privilege:** Documents comprised of notes, memoranda, reports, confidential correspondence, and copies thereof, prepared for the purposes of obtaining or providing advice concerning this litigation, of obtaining or providing information and evidence to be used in this litigation and preparing for and prosecuting this litigation.

No.	Date	Document	Sender	Recipient	No. of Pages
1.	December 23, 2015	Report #1 with attachments	Adam Tollis, Cunningham, Lindsey	Diana Sabados, Risk Management Services	4
2.	February 25, 2016	Report #2 with attachments	Adam Tollis, Cunningham, Lindsey	Diana Sabados, Risk Management Services	5
3.	April 8, 2016	Report #3 with attachments	Adam Tollis, Cunningham, Lindsey	Diana Sabados, Risk Management Services	4
4.	June 8, 2016	Report #4 with attachments	Adam Tollis, Cunningham, Lindsey	Diana Sabados, Risk Management Services	4
5.	July 18, 2016	Report #5 with attachments	Adam Tollis, Cunningham, Lindsey	Diana Sabados, Risk Management	4

				Services	
6.	January 10, 2017	Report #6 with attachments	Adam Tollis, Cunningham, Lindsey	Diana Sabados, Risk Management Services	4
7.	June 29, 2017	Report #7 with attachments	Adam Tollis, Cunningham, Lindsey	Diana Sabados, Risk Management Services	5
8.	August 4, 2017	Report #8 with attachments	Adam Tollis, Cunningham, Lindsey	Diana Sabados, Risk Management Services	4
9.	October 27, 2017	Report #9 with attachments	Adam Tollis, Cunningham, Lindsey	Diana Sabados, Risk Management Services	3

(c) **Without Prejudice Communication Privilege:** Documents containing or reflecting communications of a without prejudice nature concerning the matters in issue in this litigation.

SCHEDULE "C"

Documents that were formerly in the corporation's possession, control or power, but are no longer in its possession, control or power.

None.

HANSEN v. **CITY OF HAMILTON et. al.**
Plaintiffs Defendant

Court File No.: 17-61728

ONTARIO

SUPERIOR COURT OF JUSTICE

Proceeding commenced at HAMILTON

AFFIDAVIT OF DOCUMENTS

CITY OF HAMILTON
Legal Services Division
21 King Street West, 12th Floor
Hamilton, Ontario L8P 4W7

DANA-ELISABETA LEZAU
LSUC No.: 52306D

Tel: (905) 546-2424 Ext. 4216
Fax: (905) 546-4370

Lawyers for the Defendant,
City of Hamilton

This is **Exhibit "F"** referred to in
the Affidavit of **Byrdena MacNeil**
sworn this 15th day of March, 2023

Olivia Eng

A Commissioner for Taking Affidavits

Hamilton

Legal Services Division

Byrdena M. MacNeil, Solicitor
Legal Services Division, City Manager's Office
Office Address: 21 King Street West, 12th Floor
Hamilton, Ontario, L8P 4W7
Phone: 905-546-2424, ext. 4637 Fax: 905-546-4370
Email: bmacneil@hamilton.ca

Date: December 4, 2018

To: File

From: Byrdena M. MacNeil, Solicitor
Legal Services Division

Subject: Voicemail of Gord McGuire – Dec. 4, 2018 @ 2:34 PM
Re: FOI 18-189 - RHVP

Byrdena hi, it's Gord McGuire. Uh I apologize for dominating your time. I had a conversation with Dan McKinnon about the copying those records and he asked me to send a message and copy him as well. So we just want to make sure that there's clarity around what happened there. Um technically I did send you that note or that letter about that one truck asking for more records so sort of an interesting parallel. And lastly, I'm not sure if we talked about this yesterday but the supplier of the material to build the Red Hill was Dufferin and at the time my understanding was Councillor Ferguson was their General Manager so. That was in 2007 or so prior to him becoming a Councillor. Just in case that has any relevance, I thought I'd bring it up. Alright thanks bye.

This is **Exhibit "G"** referred to in
the Affidavit of **Byrdena MacNeil**
sworn this 15th day of March, 2023

Olivia Eng

A Commissioner for Taking Affidavits

* **solicitor-client/legal advice privilege** attaches to documents that are confidential communications passing between a client, or an expert retained on behalf of a client, and the client's lawyers, where the communications were made in the course of obtaining or providing legal advice, and the lawyers were acting in a professional capacity as lawyers

* **litigation privilege** attaches to documents that were created or came into existence for the substantial purpose of assisting a party or its lawyers in the conduct of pending or reasonably anticipated litigation

SOLICITOR-CLIENT PRIVILEGED & CONFIDENTIAL

Dear CIMA:

Re: <u>Red Hill Valley Parkway</u>

We are the lawyers for the City of Hamilton ("the City") in this matter. We confirm that this communication is strictly privileged and confidential in nature and must not be distributed any further without the express permission and consent of the City Solicitor.

The City Solicitor's office is undertaking an investigation that is being conducted for the purpose of obtaining and giving legal advice, and to obtain information for pending or anticipated litigation.

We confirm that the City has retained you for the purposes of preparing an engineering report regarding the condition of the sidewalk at the location of the Plaintiff's fall.

As part of that work, the City now requests that you review and consider the enclosed report prepared by Tradewind Scientific Ltd., entitled "Friction Testing Survey Summary Report – Lincoln Alexander & Red Hill Valley Parkways (Hamilton) (January 2014) ("the Tradewind Report"). The Tradewind Report was prepared for Golder Associates Ltd. a consultant retained by the City to complete a Performance Review after Six Years in Service of the Red Hill Valley Parkway.

Please note the following terms and conditions with regards to the City's disclosure to you of the Tradewind Report:

a. The Tradewind Report is provided to you *only* as part of this retainer which is protected by solicitor-client privilege and litigation privilege.

b. Any other use, disclosure, reproduction and/or distribution of the Tradewind Report, for public dissemination, commercial, or any other purpose or use, is strictly prohibited.

c. The City of Hamilton reserves all of its rights, including but not limited to intellectual property and copyright in the Tradewind Report.

d. The City of Hamilton reserves its rights to commence any action, litigation and/or civil prosecution for non-compliance with the herein terms and conditions.

As you may know, the City will be resurfacing the RHVP in June 2019.

We request that you report back to the City Solicitor with a written report addressing the following:

1. Your expert findings, opinions and conclusions on whether there are any remediation measures that should be taken by the City to address any safety concerns that may exist with the Red Hill Valley Parkway ("the RHVP") between now and the Summer of 2019 when the RHVP will be resurfaced.

2. Your guidance concerning whether or not possible further inquiries, investigations and testing are advisable.

This is **Exhibit "H"** referred to in
the Affidavit of **Byrdena MacNeil**
sworn this 15th day of March, 2023

Olivia Eng

A Commissioner for Taking Affidavits

Hamilton

Legal Services Division

Memorandum

Date: December 18, 2018

To: Gord McGuire

From: Pam Delry
Legal Assistant to Byrdena MacNeil

Subject: **FOI 18-189 - RHVP**

Further to Byrdena's email to you dated December 16th, 2018, please find attached the copy of the documents corresponding to the Index that have been highlighted, so that you will be able to review and consider same.

Thank you.

Pamela Delry
Legal Assistant
Legal and Risk Management Services, Corporate Services
City of Hamilton
Phone: 905-546-2424 ext. 3981

/ptd