



**CITY OF HAMILTON**  
**PUBLIC WORKS DEPARTMENT**  
 Energy, Fleet and Facilities Management Division

<b>TO:</b>	Chair and Members Public Works Committee
<b>COMMITTEE DATE:</b>	March 22, 2021
<b>SUBJECT/REPORT NO:</b>	Enhancements to City Hall Forecourt Update (PW20064(a)) <b>(Outstanding Business List Item)</b>
<b>WARD(S) AFFECTED:</b>	Ward 2
<b>PREPARED BY:</b>	Martin Dambeau (905) 546-2424 Ext. 2855 Sam Gargarello (905) 546-2424 Ext 6658 Delfina Duarte (905) 546-2424 Ext. 6627
<b>SUBMITTED BY:</b>	Rom D'Angelo, C.E.T.; CFM Director, Energy, Fleet & Facilities Management Public Works Department
<b>SIGNATURE:</b>	

**RECOMMENDATION(S)**

- (a) That Option #1 originally presented in the “City Hall Forecourt Security Study” authored by OMC Landscape Architecture (as outlined in Appendix “A” attached to Report PW20064(a)) and presented to the Public Works Committee on October 5, 2020 in Report PW20064, be approved to an upset limit of \$682,000 (inclusive of contingencies at a Class D estimate);
- (b) That the Energy, Fleet & Facilities Management Division use existing Capital Budget WIPs through appropriation from Capital Project #3722141805 to fund the work to an upset limit of \$680,000 (inclusive of contingencies at a Class D estimate);
- (c) That the “Vehicular Impact on Concrete Planter Analysis Report – February 2021” authored by Kalos Engineering Inc. (as outlined in Appendix “B” attached to Report PW20064(a)) be received; and
- (d) That the matter respecting Proposed City Hall Forecourt Security Enhancements, be identified as completed and removed from the Outstanding Business List.

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OUR Vision: To be the best place to raise a child and age successfully.

OUR Mission: To provide high quality cost conscious public services that contribute to a healthy, safe and prosperous community, in a sustainable manner.

OUR Culture: Collective Ownership, Steadfast Integrity, Courageous Change, Sensational Service, Engaged Empowered Employees.

**EXECUTIVE SUMMARY**

Through this report, Corporate Security in the Energy, Fleet and Facilities Management (EFFM) Division in Public Works Department intends to:

- Provide Public Works Committee with an update related to the resolution from Report PW20064 (Item 9.3) – (a) “That the Proposed City Hall Forecourt Security Enhancements contained in Report PW20064, be referred back to staff to review the security issues in order to ensure the safety of those who attend events at the City Hall Forecourt and the budget required to facilitate the security enhancements necessary”;
- Provide Public Works Committee with a presentation by OMC Landscape Architecture related to their original report and findings (“City Hall Forecourt Security Study” - September 2020”) that is the basis for City staff’s recommendation to proceed with Option #1 as presented in the same report;
- Provide Public Works Committee with an update of the analysis study and findings completed by Kalos Engineering Inc (“Vehicular Impact on Concrete Planter Analysis Report – February 2021”) on the existing Forecourt planters as they relate to their potential use as physical security measures for public safety of attendees in the Forecourt space;
- Return and present to Public Works Committee with City staff’s recommendation and revised budget to implement Option #1, as presented by OMC Landscape Architecture as the best option that meets various requirements including security risk (vehicular penetration), maintenance and repair considerations, public accessibility, as well as, historical and aesthetic considerations;

**Alternatives for Consideration – See Page 8**

**FINANCIAL – STAFFING – LEGAL IMPLICATIONS**

Financial: Option #1 (recommended) totals \$680K and is comprised of the following elements:

a)	Class “D” Construction Estimate -September 2020	\$450,500
b)	20% (Allowance for Class D)	\$90,100
c)	Sub-Total A	\$540,600
d)	Consulting Fees 10%	\$54,060
e)	Permits/ Heritage/ Locates/Site Plan Costs	\$60,000
f)	Escalation 5%	\$27,030
	Total:	<hr/> \$681,690
	Rounded to:	\$682,000

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The funding source for the City Hall Forecourt Security Enhancements will be through appropriation from Capital Project #3722141805 to fund the work to an upset limit of \$682,000, if through a tendering process the construction value is higher due to unforeseen market conditions or competitive conditions, staff will return to Public Works Committee prior to final contract approvals.

\*\*Note that this estimate has been revised from the original submission of \$800,000 (See Report PW20064) by reducing the Class D allowance from 30% to 20%, Reducing the Consulting fees from 15% to 10% and deleting the 15% overall contingency. These adjustments were made after staff considered ways to reduce overall cost.

The Operating Impact of Capital (OIC) for this project is estimated at \$10,000 a year and will be referred to the 2022 Operating Budget process.

Staffing: N/A

Legal: N/A

## **HISTORICAL BACKGROUND**

On December 11, 2013, Council passed a motion reinforcing the use of the City Hall Forecourt as a space for public demonstrations and protests.

On March 28, 2018, Council passed a motion directing staff to investigate and report on ways to mitigate the use of City park and public spaces by "hate groups" in consultation with various groups.

On July 12, 2019, Council passed a motion directing staff to research, identify and report on physical environment enhancements to the City Hall exterior open space to promote the safety and security of all persons who are attending the property for peaceful use and enjoyment of the space.

Council Resolution to Report PW20064 (Proposed City Hall Forecourt Security Enhancements (City Wide) (Item 9.3) (a)) presented to the Public Works Committee on October 5<sup>th</sup> 2020 – "That the Proposed City Hall Forecourt Security Enhancements contained in Report PW20064, be referred back to staff to review the security issues in order to ensure the safety of those who attend events at the City Hall Forecourt and the budget required to facilitate the security enhancements necessary."

## **POLICY IMPLICATIONS AND LEGISLATED REQUIREMENTS**

All policies with respect to landscape design and historical preservation have been considered and adhered to.

## **RELEVANT CONSULTATION**

The following City of Hamilton Departments / Divisions and external consultants have been consulted in the development of this report:

- City Manager's Office, Health, Safety & Wellness;
- Planning & Economic Development, Public Arts and Projects;
- Corporate Services, Clerks Office, Finance & Administration;
- Public Works, Horticulture, Parks, Landscape and Architectural Services, Facility Management and Corporate Security.
- OMC Landscape Architecture (plus sub-consultant Zerobit Security Planning)
- Kalos Engineering Inc.

## **ANALYSIS AND RATIONALE FOR RECOMMENDATION(S)**

As a result of the resolution issued to Report PW20064, Energy, Fleet & Facilities Management Division engaged an external structural engineering firm (Kalos Engineering Inc) to review the current existing Forecourt planter infrastructure and its potential use as vehicle penetration resistance mitigation. Kalos' analysis of the larger concrete planters currently located in the Forecourt area have identified through scientific calculations that their ability as free-floating structures to resist and reasonably prevent entry and physically stop various motorized vehicles from entering this public sphere are not effective for this purpose.

The safety and security of those who are attending the City Hall Forecourt for various activities is a priority to the City of Hamilton. Equally important in its priorities is the need to balance safety and security with the intended openness and accessibility of this public realm environment respecting the heritage, aesthetics, culture and symbolism of this space. Members of the Hamilton community who participate in a democratic and peaceful manner while in the Forecourt, are likely to presume their safety is significantly preserved while their attendance in the open space area and separated from vehicle traffic by the existing planters. Through the analysis conducted by Kalos, the City is now aware that these structures should not be considered reasonable vehicle mitigation options, and that they remain only as their original design intent and use as free-floating horticulture planter boxes only.

In October 2020, the Energy, Fleet and Facilities Management Division presented Report PW20064 (“Proposed City Hall Forecourt Security Enhancements”) to the Public Works Committee, which included a “City Hall Forecourt Security Study”, authored by OMC Landscape Architecture. The report which was received by the Public Works Committee, included addressing several current safety vulnerabilities noted by a sub-consultant (Zerobit Security), subject matter experts in physical security and safety. The findings which were publicly identified through discussion by the Public Works Committee, identified the risk type, the likelihood of occurrence and the impact of the risk to the City and its residents in the absence of mitigation measures being applied.

In addition to identifying the current vulnerabilities, several mitigating measures were presented as options with a staff recommendation compromising of structural bollards with impact resistance designs rated based on BSI Standards Publication “Impact Testing Specifications for Vehicle Security Barrier Systems”. The mitigating measures presented provided a balance of ensuring a calculated structural solution to vehicle mitigation, in addition to considering heritage preservation requirements, operational impacts of various City stakeholder divisions and the general good use of this public space.

As noted in OMC’s “City Hall Forecourt Security Study - September 2020” (attached to Report PW20064(a) as Appendix “A”), ATA Architects were engaged as a sub-consultant to provide architectural heritage subject matter expertise to this study. In the report, ATA’s review of the City Hall property heritage designation including the Forecourt space, identifies that it was based on several contributing elements that support the heritage value of the site. In contributing to the OMC recommendation, ATA states “The selection of devices to be recommended for implementation focussed on strategies to address the security function while minimizing size, mass, and materials employed on the City Hall façade.” The ATA opinion provided in the OMC’s report states “Of the various elements considered, bollards were found to be the most visually compatible, as they do not block views of the building or site.”

In the summer of 2019, and in consultation with Hamilton Police, the City temporarily installed additional smaller concrete planters to reduce the distance gaps between the original larger planters. While the additional planters create a visual sense of a strengthened concrete structure or barrier, Kalos’ study was based on the larger planters only. The measurement and calculations involved in Kalos’ study is based on the same BSI Standards presented with the mitigating options in Report PW20064 to ensure consistency in the City’s two separate external consultant reports (OMC Landscape Architecture (September 2020) and Kalos’ (February 2021)). Kalos’ report also provides potential solutions as recommendations to mitigate the knowledge taken from their study.

It is important to note that in the Kalos Engineering Inc report, the following opinion is provided;

“The planters as they currently stand would act very poorly as crash attenuators. For a sedan moving at 80Km/hr (which is the most likely impact scenario) as stopping distance of approximately 43 ft (13 m) is extremely unsafe. Civilians would be required to be at safe distance away from these barriers which would be difficult to ensure and would highly decrease the available area in the forecourt. In addition, the further sliding distance, the more likely it becomes for the planter to fall apart and produce debris or be pushed out of the way of a vehicle before bringing it to a complete stop.”

The bollard design options presented in Report PW20064 were based on the BSI Standard of “PAS 68:2013 Fixed Bollard V/1500(M1)/48/90:1.7/5.2”, which is based on the vehicle resistance factor of a 1,500 kg sedan travelling at 48Km/hr. In comparison to the opinion noted above, the same vehicle size (sedan) would come to a complete stop at 1.7 m (5.5 ft) from the bollard, with major debris extended no further that 5.2 m (17 ft) beyond the bollard’s original position.

In the Kalos study, potential solutions that were considered as mitigating options to the current planters were identified and are shown below:

- 1) “Filling a planter halfway with concrete.”  
 This option suggests that the weight of the planters is increased with poured concrete, increasing the friction produced on the ground. While this option is presented, it is suggested that the weight increase would only be approximately 12.5%, which results in a 12.5% reduction in stopping distances overall. Based on an adjusted stopping distance of the most likely scenario (sedan at 80 km/hr), the distance of 43 ft is still considered too high and this option is not considered to be feasible.
  
- 2) “Purchase an engineered bollard system.”  
 This solution would provide the City Hall Forecourt with an adequate protection system that is specifically designed to mitigate vehicle penetration distances.

Chart 1: Various Impact Resistance Calculations for a Sedan (1,500 Kg) Vehicle

	Existing Planter	Enhanced Planter (Concrete Filled)	BSI Rated Bollard
48 Km/hr Speed Impact	5 m (16 ft) penetration distance of vehicle until full stop	4.4 m (14 ft) penetration distance of vehicle until full stop	1.8 m (6 ft) penetration distance

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64 Km/hr Speed Impact	8 m (26 ft) penetration distance of vehicle until full stop	7 m (23 ft) penetration distance of vehicle until full stop	of vehicle until full stop (* Equal to or less in vehicle stopping distance)
80 Km/hr Speed Impact	13 m (43 ft) penetration distance of vehicle until full stop	11 m (36 ft) penetration distance of vehicle until full stop	

NOTE (\*) BSI bollard certification rating is: V/7500(N2)/64/90:1.8/0.0

Chart 2: Various Impact Resistance Calculations for a Pickup (2,500 Kg) Vehicle

	Existing Planter	Enhanced Planter (Concrete Filled)	BSI Rated Bollard
48 Km/hr Speed Impact	8 m (26 ft) penetration distance of vehicle until full stop	7 m (23 ft) penetration distance of vehicle until full stop	1.8 m (6 ft) penetration distance of vehicle until full stop (* Equal to or less in vehicle stopping distance)
64 Km/hr Speed Impact	14 m (46 ft) penetration distance of vehicle until full stop	12 m (40 ft) penetration distance of vehicle until full stop	
80 Km/hr Speed Impact	22 m (72 ft) penetration distance of vehicle until full stop	19 m (62 ft) penetration distance of vehicle until full stop	

NOTE (\*) BSI bollard certification rating is: V/7500(N2)/64/90:1.8/0.0

Chart 3: Various Impact Resistance Calculations for a Flatbed (3,500 Kg) Vehicle

	Existing Planter	Enhanced Planter (Concrete Filled)	BSI Rated Bollard
48 Km/hr Speed Impact	11 m (36 ft) penetration distance of vehicle until full stop	9.6 m (31.5 ft) penetration distance of vehicle until full stop	1.8 m (6 ft) penetration distance of vehicle until full stop (* Equal to or less in vehicle stopping distance)
64 Km/hr Speed Impact	20 m (65 ft) penetration distance of vehicle until full stop	17.5 m (57 ft) penetration distance of vehicle until full stop	
80 Km/hr Speed Impact	31 m (101 ft) penetration distance of vehicle until full stop	27 m (88.5 ft) penetration distance of vehicle until full stop	

NOTE (\*) BSI bollard certification rating is: V/7500(N2)/64/90:1.8/0.0

NOTE (\*): In the 3 charts shown above, various comparisons of calculated vehicle stopping distances related to an impact with an existing planter, an enhanced planter (filled halfway with concrete) and a single open market BSI PAS 68 rated bollard product are provided. For reference purposes only, the Marshalls RHINO GUARD 75/40 Protective Bollard has been shown as the “BSI Rated Bollard” in the charts below. It is important to note that this reference bollard is certified as a vehicle mitigation element with an impact by a vehicle up to 7,500 Kg at a speed rate of 64 Km/hr (BSI PAS68 V/7500(N2)/64/90:1.8). This rating is a larger impact ratio than the vehicle sizes shown in the charts, however there is a reasonable risk of probability for this type of vehicle scenario based on the traffic that uses Main Street in front of City Hall. As a result, the penetration distance until full vehicle stop calculation shown for the BSI Rated Bollard in the charts below is based on a 7,500 Kg vehicle, and the actual stopping distance would be equal to or less than 1.8 m for the various lesser vehicle sizes and speeds shown.

## **ALTERNATIVES FOR CONSIDERATION**

Alternative “A”:

As outlined in the OMC presentation, a hybrid solution of both stationary and removable bollards as well as the temporary planter placements may be considered throughout the overall Forecourt. In reference to the City Hall Site Plan as outlined in Appendix “C” attached to Report PW20064(a); with the installation of bollards along the “Park 1”, “Main 1” and “Main 2” boundary sections and the deployment of temporary planter structures along sections identified as “Main 3” and “Bay 1” may be an alternative for consideration. This type of hybrid solution may provide a buffer of distance between the Forecourt hard surface area where gatherings and events typically take place and where less resilient infrastructure would be implemented, however it also provides an inconsistent approach to vehicle mitigation throughout the Forecourt space overall. This alternative is expected to see a cost reduction in the overall project cost captured in Option #1 recommended by staff, however the actual impact would have to be assessed through a conceptual design and cost analysis. It is also expected that the cost saving through this alternative would not fully mitigate the risks. The costing of this type of option would be at a reduced impact from the original Option #1 presented by OMC and recommended by staff, based on a factor of the number of bollards not being implemented.

The estimated total project cost for Alternative “A” would be \$415,000.00.

While a reduction in cost is expected with this option, based on this type of inconsistent approach to security protection in various vulnerable areas, the analysis of the planters and the identified risks associated with their use as vehicle mitigation measures, even with modification enhancements through concrete reinforcement, this option is not recommended by staff.



Alternative “B”:

As outlined in the Kalos report (attached to Report PW20064(a) as Appendix “B”), the use of mitigating measures such as filling the planters 50% with concrete may be considered as an alternate to the current measures in place in the Forecourt. Kalos’ report does identify that the increase of additional concrete to each planter is expected to reduce the stopping distance proportionally by 12.5%. Kalos’ report also identifies some inherent risks associated with the use of concrete noting, “seeing as concrete is an inherently brittle material, it is inevitable that a portion of planter would break off in an impact scenario and this debris may travel well outside the intended stopping distance”. Kalos’ report further provides their opinion that some significant stopping distances still remain even with the reduction of an estimated 12.5% through the increase of weight by adding concrete, and the high potential for debris to be produced as a result of impact, that the planters would not be an adequate solution for safety to protect against a vehicular collision.

It is expected that the cost savings through this alternative does not significantly reduce the current Forecourt risks. While these considerations are presented in Kalos’ report, without the expansion of these types of planters throughout the entire Forecourt property an inconsistent design to vehicle mitigation would remain present as it is today. It is estimated that the use of the existing 12 large planters already located in the City Hall Forecourt would require the increase of 10 additional planter units for the distribution required in Alternative “B”.

The total project cost for Alternate “B” including additional planters and the enhancement modification with additional concrete would be \$50,000.00. This alternate is expected to have significant impacts to the operations of various City division stakeholders, the historical preservation strategies of the City Hall property and the overall aesthetics to the Forecourt space. Based on the analysis of the planters and the identified risks associated with their use as vehicle mitigation measures, even with modification enhancements through concrete reinforcement, this option is not recommended by staff.

In conclusion, this detailed planning exercise which is site specific, staff are not aware of any quantitative risk rating system addressing one option versus the other of open urban space vulnerability to vehicle attacks.

The assessment can only be qualitative as topography, access, configuration and proximity to major thoroughfares, which in this case is very site specific.

However, staff may try and rate the main recommendation and alternatives A and B. The issue will be about what outcome is desired: if it is total prevention and absolute safety, then none of the solutions outlined can deliver that with a 100% certainty and/or

guarantee. However, if it's to be determine that what is needed is to minimize risk and allow people to escape harm then we need to identify the layers as they are proposed:

The recommended solutions are all about physical security i.e. physical barriers, protection and time for patrons to react to an adverse event. Therefore, if we are to rate the 3 options at a high level, we could proceed as follows:

- |                               |   |
|-------------------------------|---|
| Option 1:                     | Bollards only: <b>A-Rating</b> : currently shown as the recommended option. |
| Option 2:<br>(alternative A): | Bollards and Planters: <b>B-Rating</b>                                      |
| Option 3:<br>(alternative B): | Concrete Filled Planters: <b>C-Rating</b>                                   |

## **ALIGNMENT TO THE 2016 – 2025 STRATEGIC PLAN**

### **Community Engagement and Participation**

Hamilton has an open, transparent and accessible approach to City government that engages with and empowers all citizens to be involved in their community.

### **Healthy and Safe Communities**

Hamilton is a safe and supportive City where people are active, healthy, and have a high quality of life.

### **Built Environment and Infrastructure**

Hamilton is supported by state-of-the-art infrastructure, transportation options, buildings and public spaces that create a dynamic city.

## **APPENDICES AND SCHEDULES ATTACHED**

Appendix "A" to Report PW20064(a) – "City Hall Forecourt Security Study – September 2020" by OMC Landscape Architecture

Appendix "B" to Report PW20064(a) – "Vehicular Impact on Concrete Planter Analysis Report – February 2021" by Kalos Engineering Inc

Appendix "C" to Report PW20064(a) – "City Hall Site Plan-Vulnerabilities"