



**INDEPENDENT COMMUNITY  
PANEL REPORT TO THE CITY OF  
HAMILTON**

**Report of the Independent Community Panel  
Submitted to City of Hamilton**

**SEPTEMBER 2006**

Transmittal Letter

**INDEPENDENT COMMUNITY PANEL**

Mr. Gerry Davis  
Director,  
Public Works Capital Planning and Implementation  
City of Hamilton  
71 Main Street West  
Hamilton, ON  
L8P 4Y5

18 September, 2006

Re: Report of the Independent Community Panel

The Independent Community Panel respectfully submits this report to the City of Hamilton.

From the time of our appointment in March 2006, Panel members have duly completed the tasks listed in our Terms of Reference as specified in Motion 7.2 dated September 1, 2005.

We wish to thank you and City of Hamilton staff for assisting us with research and conducting tours of the impacted areas.

Given climate change, many municipalities are addressing the causes and effects of severe storms. We trust that our recommendations will assist the City of Hamilton, and all Hamilton residents and businesses to be better prepared for the effects of severe storm events.

Respectfully,

Mr. Carl Bodimeade, P.Eng.  
Chair

## **DISCLAIMER**

This report presents the findings and recommendations of an independent community panel that has professional and academic experience and collectively represents expertise in the areas of stormwater and wastewater engineering, insurance issues, landscape architecture, and climate change and water resources management. The panel members have provided their time on a voluntary basis. The report is to be read as their summary opinion and is not to be interpreted as an authoritative technical document.

Any expert opinion of the authors of this report sought with respect to the report shall be remunerated in accordance with the hourly rates of the individual panel members as determined by them or as agreed upon.

*Cover Photo: Stormwater outlet on Hamilton Mountain*

## **EXECUTIVE SUMMARY**

During the summers of 2004, 2005 and 2006 the City of Hamilton experienced heavy rainstorms that left parts of the City flooded<sup>1</sup>. As a result of the flooding, many City of Hamilton residents and businesses were affected by property damage.

On September 1 2005, through Resolution 7.2, City of Hamilton Council directed staff to establish an Independent Community Panel, reporting through the Public Works, Infrastructure and Environment Committee to Council.

Five Panel members were appointed as volunteers by a resolution of the City of Hamilton Council on March 22, 2006. Four of the five have lived and/or worked in the City of Hamilton. The Panel members are: Mr. Carl Bodimeade, (Chair), Dr. Yiping Guo, Dr. Paul Kay, Mr. Paul Kovacs, and Mr. Mark Schollen.

Throughout the spring and summer of 2006, Panel members completed tours of affected areas of Hamilton, met with residents, attended community meetings, completed independent and cooperative research, requested and received information from Hamilton's Storm Event Response Group, learned about the experience of other municipalities across Canada, interviewed consultants, reviewed material available through the Stormwater and Wastewater Master Plans and met with agencies and insurance industry groups.

The Panel observed that the City of Hamilton, and its residents and businesses are not unique in having to address the effects of severe storm events. Communities across Canada have had to cope with extreme rainfall events. Some Hamilton residents and businesses have experienced significant disruption. Without concerted action in a number of areas across the City, things can become worse. Whole communities in some cities across Canada have lost the ability to obtain sewer back-up insurance. This increases the exposure of homeowners to large potential financial losses, and places a larger financial burden on the municipalities.

We believe it is necessary for the City of Hamilton and its residents and businesses to assume that severe storms will occur again. Plans and actions are necessary to avoid and minimize their effects. The problem is real. There is reason to believe that the flooding complaints registered at the time may not reflect the full numbers of residents and businesses who may have been affected, as there may be some who have chosen not to complain.

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<sup>1</sup> *Storms of June 1, 2004, July 26, 2005, August 19, 2005 and July 10, 2006*

We concluded that there is no one cause of flooding and damage caused by severe rain storms. Storms may occur in rural or urban areas and any other part of Hamilton. We reviewed Hamilton's stormwater infrastructure design and wastewater conveyance system and concluded that; while there are several areas for improvement, it is impossible totally eliminate damage from storms of all possible magnitudes. Essentially, it is necessary for the City of Hamilton to determine an acceptable level of risk when determining what areas of infrastructure design, construction and maintenance to improve. Even so, we observed that the majority of Hamilton's stormwater management infrastructure works well for the referenced storms, although there were areas that suffer a greater impact from severe storms and will benefit from improvements by the City.

There are causes of flooding and damage that will need to be addressed on a priority basis. Some of these improvements are the jurisdiction of the City of Hamilton. They are described in this report.

The responsibility for other improvements rests on the shoulders of residents and businesses. The City of Hamilton can assist by providing leadership, technical advice and implementing communications programs. We also identified several opportunities to improve how the City responds to resident complaints.

While we recommend that staff should continue to deliberate and that concerted efforts should be made to avoid the effects of storm events and undertake capital improvements, we found clear evidence that City staff were already addressing the major issues. More accurate ways of mapping storms and studies to identify knowledge gaps were being undertaken as we conducted our research. Data used by staff were up-to-date and accurate.

The Stormwater Management Master Plan, while not completed at the time of writing, is sufficiently broad and promises to serve as a framework for city-wide improvements. This Master Plan examines Hamilton's separate storm sewer systems. The Water and Wastewater Master Plan, also being completed at the time of writing, reviews Hamilton's combined sewer system area. There are opportunities to expand and enhance the existing wastewater collection system model so as to deliver analysis at a finer level of detail. Overall, we concluded that staff are well informed about Hamilton's stormwater and wastewater infrastructure and are addressing areas that suffer to a greater extent from severe storms.

Based on staff's existing knowledge and the results of the Master Plans, an inventory of areas previously impacted by severe storms, or with the potential to be impacted, should be developed. A comprehensive Flood Reduction Program should then be implemented to address flooding problems in those areas. This must be monitored and adjusted, as necessary, based on the results of flood mitigation projects then carried out and further studies.

Hamilton is of a size that it can adopt modest innovation as it plans for stormwater management. There are opportunities to improve stormwater management through the naturalization of overland conveyance systems and the adoption of non-structural solutions to enhance stormwater management. Hamilton can look for opportunities to use natural systems to store water for longer periods of time.

Opportunities exist to engage residents more frequently on a City-wide basis and to further engage those residents in severely affected communities. Hamilton deserves praise for developing brochures and newspaper inserts in response to the storms of 2005. And, more can be done. On a community-wide basis, down to a street-by-street basis, residents need to understand that if they have experienced flood damage once, they are at higher risk that it will happen again if no further action is taken.

An effective communications strategy and plan will need to be crafted and implemented. This report provides some direction. Residents and businesses need more information about features that are designed into their subdivisions (such as swales) as important stormwater conveyance tools. They need to be provided with information so that they can make informed decisions as to the right insurance to purchase. They need to know how to manage their property so as not to block stormwater infrastructure, such as catch basin inlets. The elements of the communications strategy are included in this report.

It is not the role of the Independent Community Panel to recommend policy; however, we identified a number of policy questions that need to be examined further by the City and its residents. For example, what is the level of risk of flooding that Hamilton residents are willing to accept? What does this level of risk relate to in terms of design criteria and costs that the City and its taxpayers will have to finance? Over what period does the city want to upgrade its infrastructure, where necessary, to meet these levels of risk? In these discussions, the balance between reducing potential damage from extreme storms and the increased cost of providing infrastructure to achieve that must be emphasized. Some of the questions can be addressed by staff. There is also an opportunity for Hamilton Council to engage residents on a City-wide basis in a positive and constructive dialogue on these matters.

We had initial discussions with insurance companies, and learned that if the City wants to rebuild insurance companies' confidence in its capacity to manage severe weather, the City will need to prove that Hamilton is initiating improvements in a positive and proactive manner.

We thank the City of Hamilton for appointing us and humbly offer our recommendations for your consideration.

August 2006



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Mr. Carl Bodimeade, P.Eng.  
Chair



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Dr. Yiping Guo, P.Eng.



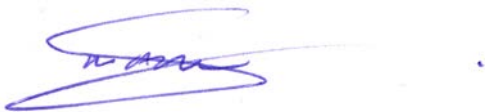
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Dr. Paul Kay



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Mr. Paul Kovacs



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Mr. Mark Schollen

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# 1. BACKGROUND

During the summers of 2004, 2005 and 2006 the City of Hamilton experienced heavy rainstorms that left parts of the City experiencing floods and sewer back-ups<sup>2</sup>. The August 19, 2005 storm was the biggest one of this group, yielding over 60 mm of rain in just over one hour. The others produced about 50 mm in approximately 2 hours. By way of comparison, 95 percent of storm events yield 25 mm of rain or less in a 3-hour duration.

The effects of the flooding were varied, yet the power of the runoff from these storm events was unprecedented. Following the August 2005 storm, for example, 64 truckloads containing over 1000 tonnes of shale and debris were required to be moved from the Chedoke Golf Course West Inlet. During the August 2005 storm, combined stormwater and wastewater making its way to the Woodward Avenue Wastewater Treatment Plant's Influent Pumping Station required seven of the station's pumps to be operated. In the July 2006 storm, seven pumps were again operated to handle the stormwater and wastewater flow. Four of the pumps at the plant are normally sufficient to handle the volume from ninety-five percent of rain events.

It was clear that these were major storms. As a result of the flooding, many City of Hamilton residents and businesses were affected by property damage and financial losses totaling hundreds of thousands of dollars. The largest losses faced by homeowners involved sewers that backed up, bringing waste into homes. The communities of Woodward, Westmount, East Gage Park and residents in the area of the Chedoke Hospital were particularly hard hit in



*Chedoke Park – flooded during the August 2005 storm. May 2006. Photo credit: Hardy Stevenson and Associates Limited*

2005. In July 2006, the most affected area was Ward 4 in the lower east side. After the storm events of 2005, approximately 300 residents made complaints to the City of Hamilton. The City received 150 complaint calls after the July 2006 storm. The majority of these complaints involved sewer back-up.

In addition to residential and business flooding, Hamilton experienced flooding in parks and recreational areas, flooding of underpasses, and erosion in streams and areas of overland water conveyance.

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<sup>2</sup> *Storms of June 1, 2004; July 26 and August 19, 2005; and July 10, 2006*

The events of the summer of 2005 led to the formation of Hamilton's Storm Event Response Group (SERG). This group, which consists of City staff, meets monthly and is leading the City's effort to examine causes and effects of severe storm events.

On September 1 2005, through Resolution 7.2, City of Hamilton Council<sup>3</sup> directed staff to establish an Independent Community Panel, reporting through the Public Works, Infrastructure and Environment Committee to Council.

This is the report of the Independent Community Panel.

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<sup>3</sup> *The Council resolution is attached as Appendix A*

## 2. INDEPENDENT COMMUNITY PANEL

In September 2005, Council approved a motion to establish an Independent Community Panel to assist staff by reviewing the causes, effects and outcomes of storm events and making recommendations to Hamilton City Council<sup>4</sup>. Five Panel members representing various disciplines were appointed as volunteers by a resolution of the City of Hamilton Council on March 22, 2006. Four of the five have lived and/or worked in the City of Hamilton. The members are as follows:

- Mr. Carl Bodimeade, P.Eng. (Chair) – wastewater engineering specialist
- Dr. Yiping Guo, P.Eng. – McMaster University specialist in watershed planning and stormwater management
- Mr. Paul Kovacs – specialist in insurance issues and founder of the Institute for Catastrophic Loss Reduction at the University of Western Ontario
- Dr. Paul Kay– University of Waterloo specialist in climate change and water management
- Mr. Mark Schollen, BLA, OALA, CSLA – specialist in landscape management

Specifically, the Panel's mandate was to:

- Address the causes and effects of inclement weather on the storm management/drainage systems in the City of Hamilton;
- Establish a communications strategy to assist in educating the general public on issues concerning risk management, compensation, potential health risks, etc.;
- Conduct a high-level review of the City of Hamilton's proposed stormwater and wastewater master plans;
- Review and consult with the insurance industry.

Panel members were provided secretariat support by an outside consulting firm.

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<sup>4</sup> *The Terms of Reference of the Independent Community Panel is attached as Appendix B*

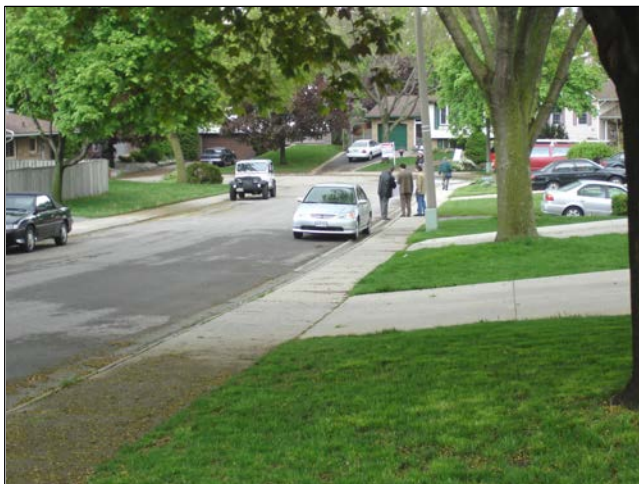
### **3. ACTIVITIES COMPLETED BY THE INDEPENDENT COMMUNITY PANEL**

Throughout the spring and summer of 2006, Panel members completed tours of affected areas of Hamilton; met with residents; attended community meetings; completed independent and cooperative research; requested and received information from Hamilton's Storm Event Response Group ("SERG"); learned about the experience of other municipalities across Canada; interviewed consultants; reviewed material available through the Stormwater and Water and Wastewater Master Plans; and met with agencies and insurance industry groups. The following is a synopsis of key research activities.

#### **3.1 Initial Meeting with SERG**

The Independent Community Panel had a preliminary discussion (May 2, 2006) with SERG members and their stormwater consultants on the causes and effects of inclement weather on the stormwater management and drainage systems in Hamilton. Panel members were provided with an overview of 2005 storm events and were presented with information about the Stormwater Management Master Plan. In advance of field tours, the Panel was provided with an overview of the Mountview neighbourhood stormwater study<sup>5</sup>.

#### **3.2 Walking and Driving Tour of Mountview Neighbourhood**



On May 16, 2006 Independent Community Panel members visited Ancaster and west Hamilton and completed a walking tour of the affected areas of the Mountview Community. The itinerary included: areas around Greencedar and the

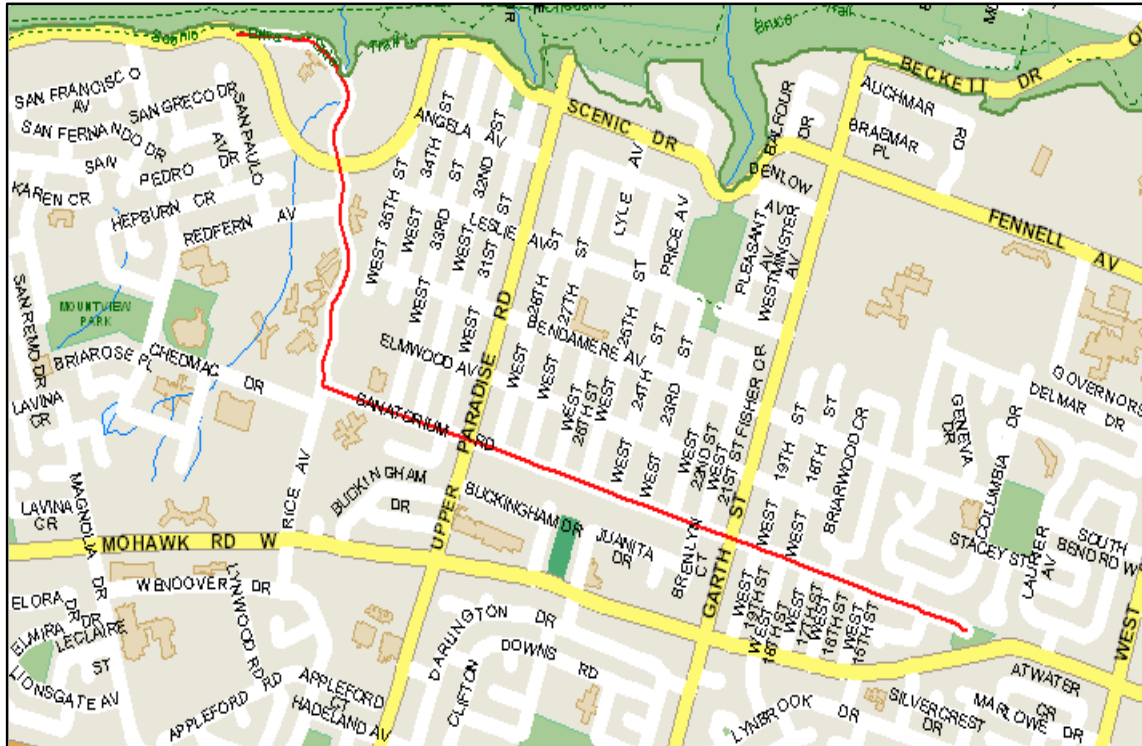
*Homes affected in the Mountview Neighbourhood. Note the down-sloping driveways. May 2006. Photo credit: Hardy Stevenson and Associates Limited*

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<sup>5</sup> *Mountview Neighbourhood Storm Drainage Study and Storm water Management Facility Location Review, MRC, Overview, May 2, 2006*

Lincoln Alexander Parkway-MS, Wendover, Idlewyld Manor, Scenic Drive and the Sanatorium and various outfalls along the escarpment. The walk provided an opportunity to talk to a homeowner affected by the flooding. Maps and other documentation were provided.

The map below shows areas visited during the May 16, 2006 site visit. Source: MapIT



### 3.3 Independent Research and Liaison with Industry and Stakeholder Groups

Panel members received and reviewed background material including: information on the claims regarding property damage; meteorological and climatological data of the August 2005 storm; reports on mapping rainfall data<sup>6</sup>; current and previous design standards for the City’s storm sewer systems; McCormick Rankin’s reports on storm drainage and stormwater management facility location; Hamilton topographic, watershed, and physical mapping; data on waste water modeling; percent vegetation cover; graphics showing rainfall capacity levels and locations of complaints received; and information on the frequency of occurrence of these storm events.

Other activities completed by the Panel and independent of Hamilton staff support included:

<sup>6</sup> Hill, C., et al, *The Application of Radar Rainfall Data to Collection System Analysis*, XCG Consultants, Kije Sipi Consultants and York Region, No Date

- Liaison with Environment Canada regarding storm event characterization;
- Liaison with insurance industry groups and other municipalities on June 16<sup>th</sup> through an event sponsored by the Institute for Catastrophic Loss Reduction;
- On behalf of the Panel, support staff attended and reported on meetings of the Water and Wastewater Master Plan<sup>7</sup>.

### **3.4 Attendance at GRIDS Public Information Centre**

Through the Chair, the Panel had an opportunity to interact with Hamilton residents interested in the Water and Wastewater Master Plan through a Public Information Centre on July 6.

### **3.5 Walking and Driving Tour of East Hamilton**

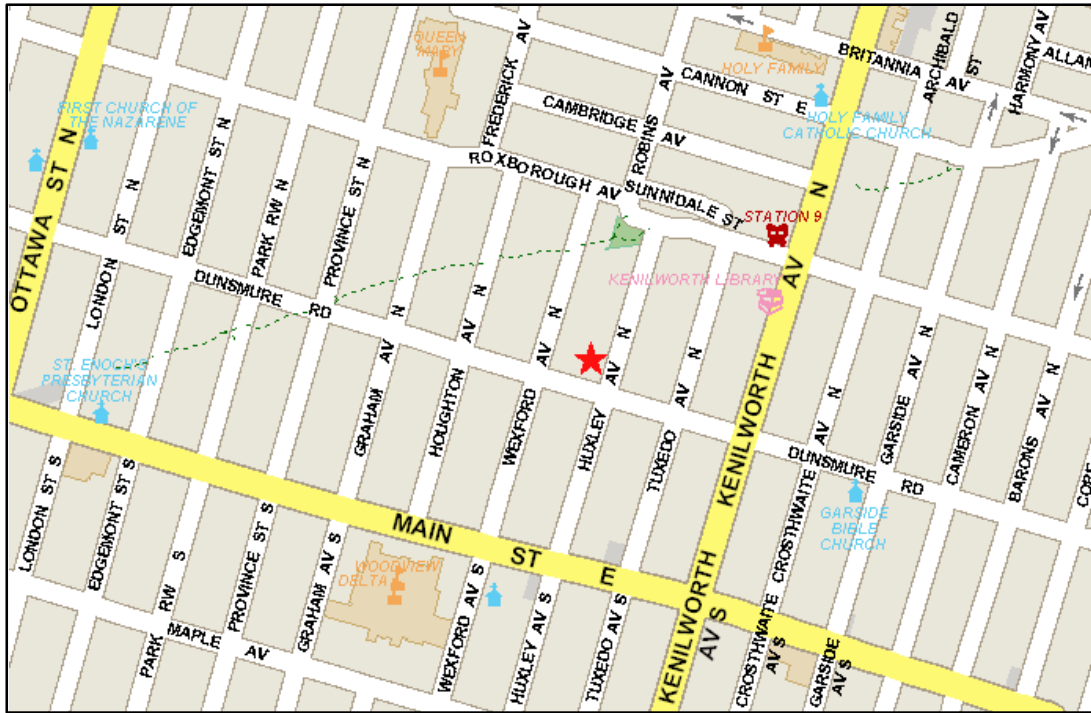
Independent Community Panel members visited East Hamilton, Gage Park and completed a driving and walking tour of Kenilworth Avenue, Ottawa Street, Main Street, Edgemont and Huxley Streets on July 14, 2006. Maps and other documentation were provided.



*East Hamilton homes affected by storm damage.  
Huxley Avenue, south of Main Street. July, 2006.  
Photo Credit: City of Hamilton.*

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<sup>7</sup> *Hamilton Water and Wastewater Master Plan, Wet Weather Workshop, Hamilton Convention Centre, May 29 and June 28, 2006*



The map above shows some of the areas visited on July 14. Source: MapIT

### 3.6 Second Meeting with SERG

The Independent Community Panel had a second meeting with SERG on July 14<sup>th</sup>. Panelists were provided an update of how Hamilton is proposing to characterize extreme precipitation events<sup>8</sup> and received an update of stormwater protection activities.

### 3.7 Attendance at City of Hamilton Public Meeting

Members of the Independent Community Panel attended the public meeting on infrastructure and flooding issues on August 10, 2006. This meeting was attended by the Mayor of Hamilton and the Councillors of Wards 3, 4 and 8. Approximately 400 people attended the meeting, primarily from Ward 4. Presentations were given on the City of Hamilton's response to the flooding program and on a recently approved Compassionate Grant program to subsidize residents who have experienced flooding and sewer back-ups from storms declared as disasters by City Council. In August 2006, Hamilton City Council declared the rainstorms of July 2005, August 2005 and July 2006 to be city-wide disasters, and a rainstorm on July 26, 2005 to be a disaster in Borer's Creek Area and Waterdown. A one-time Compassionate Grant fund

<sup>8</sup> *Extreme Precipitation Event Characterization: Summary Work Plan for the City of Hamilton, Kije Sipi Consultants; July 2006*

of \$750 per flood has been set up for homeowners that have been affected by basement flooding. Any funds paid under this program will be deducted from any potential future claim settlement to avoid duplication of damage payments. Residents who are currently in litigation with the City would be ineligible. (See: Appendix C: Compassionate Grant Policy)



## 4. FINDINGS AND OBSERVATIONS

### 4.1 The City of Hamilton is not Unique in Experiencing Storm Events

It is obvious to the Independent Community Panel that the June 1, 2004, July 26<sup>th</sup> and August 19<sup>th</sup> 2005, and July 10, 2006 storms were severe, particularly the August 19<sup>th</sup> storm. Hamilton, however, was not alone in experiencing a major impact from such severe storms. For example, the City of Peterborough experienced extensive flooding in 2004, and there was basement flooding, roadway washouts, and erosion in ravines and watercourses in Toronto from the August 19, 2005 storm<sup>9</sup>.

Rainfall data for the 2005 storm events that we received were obtained from a rainfall gauge located within the Mountview Neighbourhood and analyzed to determine the frequency of the two 2005 events (i.e. how often do these storms occur on average?). The frequency is typically expressed in terms of a "return period". A storm with a return period of 2 years (2-year storm) means that a storm this size would occur on average once every two years. A 100-year storm would occur on average once every 100 years and would thus be considered a very infrequent storm event.

#### 4.1.1 Storm Characteristics

The storm characteristics (at the gauge recording maximum rainfall) were compared by Hamilton staff to rainfall intensity-duration-frequency (IDF) data developed from 35 years of rainfall data from the rain gauge at the Royal Botanical Gardens and from 30 years of rainfall data from the rain gauge at the Mount Hope Airport. The characteristics of the storm events in 2005 and 2006 are as follows:

Date	Gauge	Duration	Amount mm	Est. Return Period (MH) Years	Est. Return Period (RBG) Years
26 July 2005	Daffodil	1 h 50 m	50.2	5-10	25-50
19 August 2005	Daffodil	1 h 5 m	60.4	50-100	>100
10 July 2006	Calder005	2 h 10 m	29 (total rainfall for day was 48)	10 (comparison station unspecified)	
"normal"		3 h	60		

<sup>9</sup> *Work Plan for the Engineering Review Addressing Basement Flooding, Toronto Water Staff Report to the Works Committee, March 7, 2006*

The total rainfall for the August 2005 storm has a return period between 50 and 100 years depending on which comparison gauge's IDF data are used. In other words, this amount accumulated over an hour is expected to recur only once or twice in a span of 100 years. The 15-minute maximum rainfall intensity amount for this storm has a return period between 10 and 50 years depending on which IDF data are used.

The July 2005 and July 2006 storms had lower return periods, meaning they are more frequent and less severe rainfall events than the August storm. In a 100-year span, storms of this size might be expected to recur 4 to 10 times.

Another important characteristic of these storms is the spatial variability. The July and August 2005 storms were most intense in the west mountain area, whereas the July 2006 storm was most intense in the lower east side. The July 26, 2005 storm equalled the 50-year event for the 60-minute duration on the West Mountain, whereas in Wards 3 and 4 this storm equalled the 25-year event for the 60-minute duration. The July 10, 2006 event equalled the 10-year event for the 15-minute duration in Wards 3 and 4. Rain gauge data from 15 sites showed that the August 2005 storm, for example, was greatest at the Daffodil gauge in the West Mountain area. The return period for the 1-hour rainfall amount was estimated to be greater than 100 years. At neighbouring gauges within just a few kilometres, return periods for the amount of rain received were 10 years (Firehall Calder001, Garth, Terryberry Library) or less. This pattern well illustrates the small scale and localized nature of intense summer convective precipitation.

Apart from these severe summer thunderstorms as experienced in 2004-2006, two other "worst case scenarios" can be envisioned:

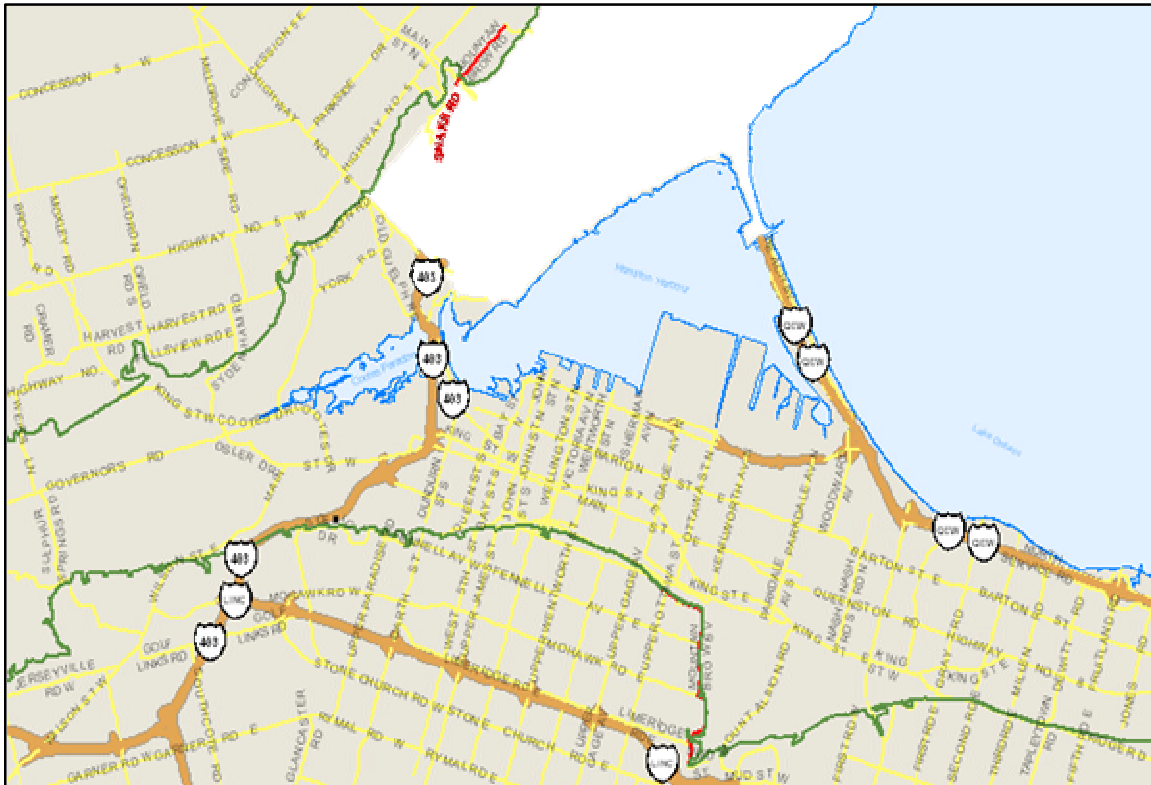
(1) severe downpour in early spring coinciding with snowmelt runoff and frozen, or saturated, ground. Such an event would produce considerable overland flow; and

(2) passage of a "Hurricane Hazel" type of system over Hamilton. Such an event would produce wide-spread, long-duration, and heavy rainfall, resulting in saturated ground and much overland flow.

#### **4.1.2 Effect of Hamilton's Location**

Hamilton's geographic and topographic position—on Lake Ontario and within the Niagara Escarpment—may produce some enhancement of summer convective rainfall. In mid-to-late summer, lake temperatures begins to surpass land surface temperatures, adding some instability to air masses; the Escarpment always presents a topographic barrier to on-shore winds, causing uplift. We found minor evidence that the Hamilton areas experience a greater summer frequency of large rainfall events than other areas of

Ontario. For the 1971-2000 normal period, the Hamilton A station experienced an average of 0.87 (July) and 0.83 (August) days with rainfall = 25 mm. These values were larger than at most other stations in the Greater Toronto, Golden Horseshoe, and southwestern Ontario region, certainly for July, less so for August. The interpretation is not unequivocal, though; the average experience for the Hamilton RBG station was 0.59 days in July and 0.81 days in August.



The above map shows Hamilton's location on Lake Ontario and the Niagara Escarpment, highlighted in green. Source: MapIT

### 4.1.3 The Effects of Severe Storms on the Community

During our tours and research, the Independent Community Panel identified significant negative effects to Hamilton's communities and businesses as a result of these storms. Flooding damage and insurance claims occurred in various regions of the City.

We saw businesses having to hire salvage and restoration companies to pump out basements and clean up damaged goods. We became aware of homeowners who had storm water back-ups and also the more damaging sanitary sewer back-ups. Wastewater (sewage) causes considerably more damage than water damage alone.

The Panel heard resident concerns about health effects due to mold, mildew, feces and bacteria from sewage back-ups. Health effects are not specifically included in our Terms of Reference. However, we feel that there is an opportunity to better inform residents and businesses, through the Medical Officer of Health, about the proper removal of sewage and clean-up of basements so as to avoid health effects.

We also observed stream erosion, and parks that became stormwater management ponds. Impacts on transportation systems are a secondary, but significant, impact of these storms. Highway 403 at the Escarpment was forced to close due to the sheer volume of water and debris falling onto the Highway from storm outlets on the escarpment above in the August 2005 storm. The cover photo shows such an outlet. We saw several roads and an underpass in East Hamilton that were forced to close in the July 2006 event.



*Recurrent flooding at the Kenilworth Street Bridge.  
July, 2006.  
Photo credit: City of Hamilton.*

Based on these observations, we came to several conclusions:

- a) Severe storm events affect more than homeowners. They also affect roadways, parks, businesses, and streams.
- b) Storm events affect more than built infrastructure. The storms cause flooding, erosion, deteriorate water quality, cause groundwater contamination, and affect aquatic and terrestrial habitats.
- c) Through discussions with staff we surmised that problems/complaints may be more widespread than those reported to the City of Hamilton or insurance companies. City staff told Panel members that their accounts of complaints are only of those called in; they feel that more

problems may have gone unreported, in part because of insurance considerations.

Perceptions research completed in other communities shows that the majority of residents and businesses experiencing sewer back-up damage believe that the damage is due to failure by the municipality. That is to say, when the sanitary sewer system brings waste into homes or businesses it is viewed by residents as a failure by the municipality. This comment was certainly repeated at one of the community meetings.

#### **4.1.4 Climate Change will be an Ongoing Factor**

While our mandate did not call for us to complete research about climate change, there are no disagreements among Panel members that climate change will be a continuing factor that Hamilton must address.

The Canadian Institute for Climate Studies, University of Victoria, has archived numerous climate change scenarios for Canada<sup>10</sup>. The scenarios, from seven major climate change models, differ both in parameterization and structure of the modeled physical system, and in assumptions about global socio-economic development and conditions. The results for the Hamilton region, for mean summer (June-July-August) temperature and precipitation at 2050 (i.e., for a 30-year average centred on 2050), are as follows (all data are changes with respect to 1961-1990 means):

	Temperature change °C	Precipitation change %
"coolest driest"	+1.6	0.0
"coolest wettest"	+3.0	+14
"warmest driest"	+3.7	-7
"warmest wettest"	+5.7	-4

These results are somewhat ambiguous. However, there is no disagreement that summers are likely to be warmer, by about 2 to nearly 6 °C. Many scenarios suggest summers may also be wetter, but several suggest drier conditions. Other considerations, however, modify these indications in some important ways: even if total rainfall increases, the warmer temperatures suggest more evaporation, so that effective rainfall will be less (i.e., it will be drier for soil moisture, agricultural production, groundwater storage); and, summer rainfall is likely to be in the form of more frequent, intense events than we have been used to.

There is a growing consensus that the effects of global climate change will include more frequent intense summer storms in the region. Given the small scale of individual storm cells, and the highly variable spatial occurrence of

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<sup>10</sup> "Canadian Climate Impacts and Scenarios", <http://www.cics.uvic.ca/scenarios>

these storms, it is not possible to predict either the number, or the locations, of these expected changes.

Global climate models also suggest a strong likelihood of increased tropical storm (including hurricane) activity in the North Atlantic Ocean. Changes may include more storms each year, greater intensity of storms, and intensity of storms persisting farther north, than we have experienced in recent decades. Climate models do not yet allow us to assess the likelihood of more frequent passage of tropical storm activity through the lower Great Lakes area. The effects of these storms may be a one-time occurrence for some homeowners. However, given the climate trends, we believe residents and businesses need to assume that severe storms will occur again and perhaps more frequently. If damage has occurred once, without further mitigation measures, there is a significant risk that damage will occur again. Plans and actions are necessary to avoid and minimize the effects of severe storms. The problem is real.

#### **4.1.5 The Primary Source of the Problem is the Sheer Magnitude of these Storms**

Through our examination of the data and observation on field trips, we noted that the effects of severe rain storms in the areas with separate stormwater sewers tended to follow the overland flow route. The areas from which most complaints were received corresponded with these routes. However, a separate problem occurred in areas where residents of Hamilton experienced sewer back-ups. The excess rainfall did not always follow the overland flow routes. Instead, water and sewage ended up in basements. We also noted that effects were occurring in rural areas as well as urban areas. We came to an initial conclusion that the primary source of the problem is the temporal and spatial characteristics of the storms themselves, which are unique to each storm, but that the effects of the storm may be dictated by the characteristics of the urban landscape and infrastructure in that area.

Indeed, the stormwater management system overall worked well in most areas of Hamilton. That is, in any given storm, the greatest rainfall may overwhelm the drainage systems temporarily and locally. The storms that Hamilton experienced, and the sheer volume of rain, has the potential to exceed both modern, well designed stormwater management systems, as well as outdated stormwater management systems. These storms may affect any community and any part of Hamilton. The same storm may produce different flood effects in several communities along its path.

A typical storm consists of a centre of greatest intensity, and a wider area of lesser intensity. The storms continue to move, and the path of the locus of greatest rainfall thus defines a swath of greatest stormwater deposited. The storm sewer and combined sewer systems in this case are both called into service until both are overwhelmed. At this point the overland (the major

system) conveyance system (roads, parks, lawns and streams) becomes a method of transporting the large volumes of runoff water.

## **4.2 The Panel Identified Multiple Factors in Storm Event Related Damages**

### **4.2.1 Review of Effectiveness of the Overland Flow System**

During the tour of the Mountview Community, the panel saw an area near the Chedoke Hospital where the stormwater management (SWM) pond was overburdened in storing or slowing down overland flows. Neighbouring parks and open spaces had instead become small ponds, holding stormwater until it could dissipate. The Panel saw other examples where the storm flow had by-passed storm drains and were under utilized for storm flow where flooding of front yards occurred.



*Stormwater management pond in Mountview Neighbourhood. May, 2006.  
Photo credit: Hardy Stevenson and Associates.*

Panel members observed inlet culverts that appeared to be inappropriately sized and the need to re-grade the inlet culvert of the SWM pond and reconfigure its outlet to make it function more effectively. The Panel acknowledged that Hamilton staff were already considering solutions. In some cases changes to maintenance and remedial measures (clearing of debris) are recommended and could occur on a routine basis as well as before and after severe storm events. The City of Hamilton has identified hot spots based on previous years' flooding, and staff attends to those sites in advance of storm events to ensure the stormwater will flow as intended. In other instances, engineering consultants will need to be retained to examine in detail the weak parts of the system and recommend appropriate solutions.

#### **4.2.2 Planning, Sub-Division Design and Landscaping are Factors**

During our brief review, we could find no apparent causal relationship between higher elevation new sub-division developments and the specific flooding of down-gradient communities during these storm events. However, we believe that some future sub-division applications may merit a broader examination of storm runoff effects through the completion of watershed or sub-watershed studies. To this end, we are pleased to see that Hamilton adopted Storm Drainage Policies in 2004, requiring new developments to demonstrate how they will improve both on-site and off-site stormwater management systems.

From a housing design perspective, it is obvious to us that more serious attention can be given by architects to the design and use of garage and basement spaces. This is a national issue, and not just a Hamilton issue. A generation ago, basements and garages were used for storage. Past flooding may not have had as significant a financial cost. Today these spaces are often used as living space. Insurance damage claims are high as electronics, expensive furniture, office files and other costly items are damaged as a result of flooding and sewer back-ups.

Not all of the damage is caused by stormwater being conveyed by the overland flow route. Given the amount of rain experienced, flooding problems also originate from soil saturation. In the situation where soils become saturated, basements are not designed to deal with high hydrostatic pressures. Without significant protection around the perimeter of the homes, and functioning weeping tiles and stormwater laterals, flooding is inevitable. It is possible that the August 2005 effects in the Mountview area were exacerbated by the preceding July storm. That is, the soil may have already been near saturation, meaning that there was less storage capacity than would have been expected without the July event.

Additional problems can occur when basement apartments are built without consideration to back-ups of drains and toilets. Alterations to basements may occur without municipal inspection and the interconnection of storm and sanitary drains without inspection may be problematic. In some instances, basements may be too low and as a result, storm and sanitary sewers may be prone to frequent back-ups.

Other urban design flaws include homes with down-sloping driveways (and below-ground garages). When the volume of water builds along a roadway (otherwise designated as an overland conveyance route) and exceeds a certain threshold, runoff can overflow the lip of a driveway. For homes with this design, the water can flow down driveways and into garages.

In several instances, catch basins were observed to be installed within grassed or landscape areas and were obstructed by grass clippings or debris, impairing their function.



### **4.2.3 Cleaning and Maintenance are Factors**

Deterioration of some storm sewers and blockage by debris inside the sewer is another important cause of flooding. The City of Hamilton has a long-term plan in place to remediate or replace aging infrastructure. The City also has a regular program in place for inspecting and cleaning debris that may have fallen into storm sewers. Overall, their use of high-tech CCTV and other inspection systems appear to be state-of-the-art.

Problems also occur when material, such as leaves and debris, blocks catch basin inlets. We were also provided with ample evidence of City staff efforts to clear storm catch basin and culvert inlets and drain areas before and after storms.

In order to optimize the efficiency and effectiveness of street sweeping and catch basin cleaning initiatives, these programs should be implemented with regard for the streetscape characteristics of the various neighbourhoods within the City. Areas with mature trees and extensive canopy cover are recommended to be subject to more frequent street sweeping activities than areas where street trees are less mature. Certain species of trees can produce more litter, seeds and debris than other species. Areas of the City planted with these species are recommended to be subject to a more frequent maintenance cycle to minimize the potential for the blockage of catch basin inlets.

### **4.2.4 Homeowner Alteration of Swales and Lot Grading**

The Independent Community Panel saw several examples where homeowners had altered lot grading, filled in swales and changed landscaping on their property, impeding overland flow routes and potentially causing water to back-up onto the property of their neighbours. Homeowners are likely unaware they are creating areas of blockage and sag areas that in-turn impact the efficiency of the drainage system within their neighbourhood. An additional cause of flooding is the blockage of storm drains and catch basins on private property by leaves, debris or grass clippings. City of Hamilton staff are not able to enter private property to return grading to its original condition or clear debris and consequently it is important that homeowners be educated about the function of swales within their property and be made aware of the importance of maintaining drainage systems free from blockage.

### **4.2.5 Combined Sewer Systems**

A large part of Hamilton below the Mountain was developed before the construction of separate storm and sanitary sewer systems became common. Thus, there are parts of Hamilton with separate storm and sanitary sewer

systems, and parts of Hamilton with combined sewer systems. During severe storms, storm and sanitary sewer flows may become merged in areas with combined sewer systems. As a result, excess stormwater entering the sewer system will back-up into basements through the sanitary sewer. Connections of stormwater, and combined stormwater and sewage, the back-up of combined sewage creates the most significant damages as it greatly impacts personal property and is therefore the higher priority problem for homeowners and businesses. Potential health risks may also be associated with sewage back-ups, but the Panel has not specifically addressed this issue.

The combined system is generally located in the downtown area of Hamilton. As in other cities, the combined system has both the sanitary sewer connection coming from the building on the property and the storm sewer connection coming from the roadway catch basin in front of the property connecting to one combined trunk sewer that goes to the wastewater treatment plant<sup>11</sup>. As a result, when there is a back-up in the sewer system combined sewage re-enters residences and businesses through the sewer drains and toilets. In some instances, during severe storms, stormwater may even enter normally separated sewer systems and causes overflows.

#### **4.2.6 Are Design Standards Appropriate?**

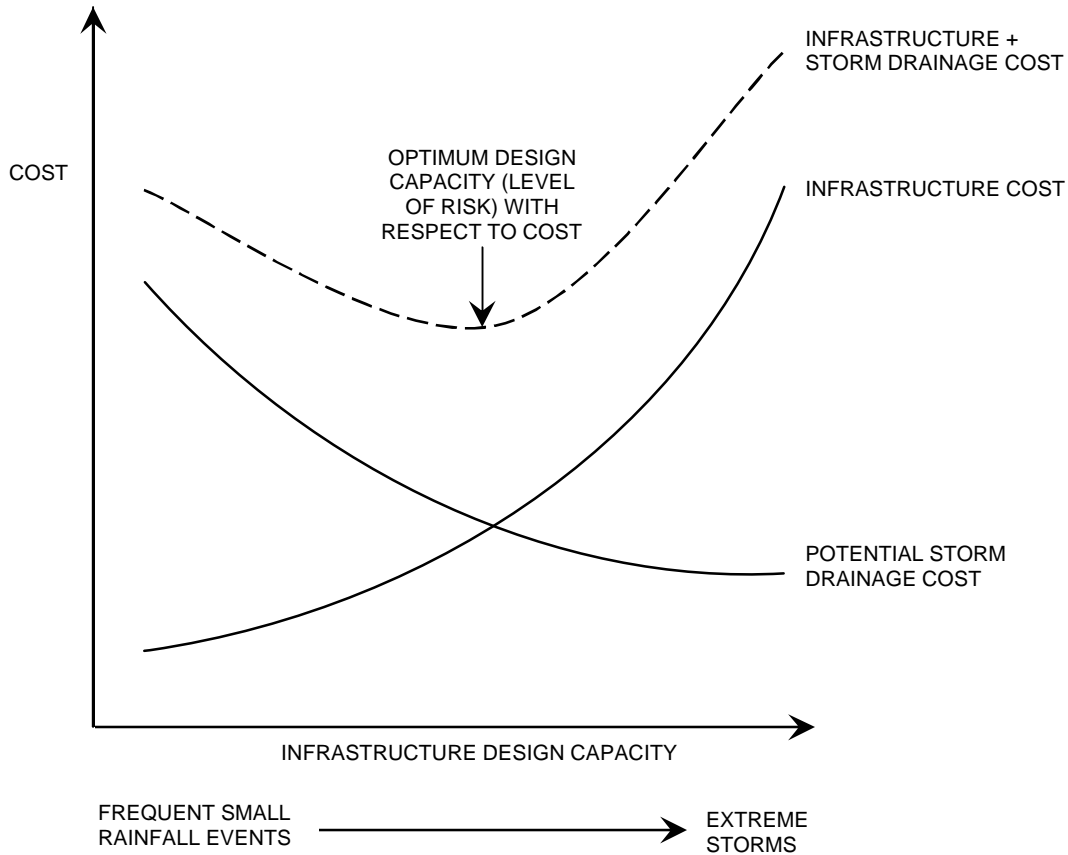
The amalgamated City has brought together different systems and standards from the former municipalities that need to continue to be consolidated to achieve a single standard to be applied throughout all areas of the City. For example, gains can be experienced through “non-structural” measures such as downspout disconnections. The City is investigating a downspout disconnection program through SERG but does not have such a program in place yet.

Hamilton’s “Development Engineering Guidelines” (2003) indicates 15-minute rainfall intensities with return periods of 2 to 5 years are to be used, except in older areas of Hamilton, where a 50-year return period is to be used, in calculation of the design flows. While it was tempting for the Independent Community Panel to examine more stringent design standards, we concluded that severe storms experienced by the City would exceed the most stringent standards that can be reasonably implemented in consideration of practical and financial parameters. Rather than implementing the most stringent design standards and aiming to accommodate 100 year storms, the City will need to determine an acceptable level of risk. There are benefits and costs, including financial costs, associated with designing for more extreme storms. This is shown in the figure below. If more stringent design standards (i.e. those intended to deal with larger storms) are adopted the cost of potential

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<sup>11</sup> *Public Works Community Report on Stormwater Management, Insert to the Hamilton Spectator, October 2005, p. 2*

storm damage decreases; however, the cost of constructing that infrastructure increases. At a certain infrastructure design capacity, the combined cost is minimized; this is the optimum design capacity and level of risk from a financial point of view. Other socio-economic factors should be taken into account and may require some adjustment to the level of risk originally adopted.



The Panel reviewed the potential for the adoption of design changes. Modifying Hamilton’s stormwater management system to cope with larger storms, such as 10- to 15- year return period storms would result in a large cost for uncertain gain. The most severe impacts are occurring as a result of the rare 100-year (or less frequent) storms. These larger severe storms would still exceed incremental improvements to design standards. Thus, it is prudent to focus attention on maintaining the integrity and function of the overland flow routes.

The Panel questions how much longer historic rainfall data can be used as a benchmark for infrastructure design. The Panel concludes that it will be impossible to ensure that design standards applied to every corner of the City will have the same effect due to topography, illegal alterations to sewer

connections, complexity, etc. The issue that City engineers need to consider is how to address changes in storm intensity in the future.

### **4.3 No Insurance or Wrong Insurance**

Insurance companies paid more than \$500 million in sewer back-up damage claims in Toronto, Hamilton and elsewhere across Ontario as a result of the August 19, 2005 storm, which was Canada's most costly sewer back-up event. However, we became aware of some residents who were not insured, under-insured or who had not reported the effects of storm events for fear of losing their residential insurance. The immediate effect of this is the homeowner's inability to obtain financial assistance to hire restoration companies and the inability to claim for damages. We learned of residents who experienced flooding during the summer of 2004, and had not made repairs or improvements by the summer of 2005, and were flooded again.

The Panel is concerned that until the August 2006 announcement of the Compassionate Grant Policy, none of the residents that requested compensation from the City had been given any financial assistance. And, we feel that there is room for the City to be proactive in assessing the extent and severity of damage and becoming more responsive in addressing complaints from residents. It is obvious that attention needs to be placed on educating Hamilton residents on how to obtain the right insurance coverage and how to keep their insurance once the policy is in force. Private insurers typically pay within two weeks and cover all repair costs, damage to contents and additional living expenses; whereas only essential items representing a small percentage of the loss are covered by Province of Ontario funded programs.

The City should assist in ensuring that residents are receiving proper communication on insurance issues. For example, almost every property owner in Hamilton purchases basic insurance coverage against a range of hazards including the risk of fire and theft. Most have the option of adding, for a fee, sewer back-up insurance coverage. The cost of sewer backup coverage varies depending on factors like the location of the property and its value, but the average cost for homeowners is less than \$50 a year. Residents should be aware of such options, so that they can make informed decisions.

We also learned of whole communities elsewhere in Canada who have lost their ability to be insured against sewer back-up damages due to repeated claims resulting from stormwater damage. The effect can be severe as the loss of sewer back-up insurance exposes homeowners to large potential financial losses. Some municipalities have then been placed in the difficult and potentially costly position of being pressured to assume the cost of the loss of insurance and/or having to pay for subsequent damage claims.

For Hamilton area insurance companies, the payouts for damages due to the storms have been high. A cost of \$50,000 per home is not unusual. The average cost of remediation/compensation in 2005 dollars is \$18,467 per home and \$39,500 per business. Nationally, this is in-line with the average pay-out from private insurance companies, which typically exceeds \$30,000 per home when the waste enters a home through the sanitary sewer system.

#### **4.4 City of Hamilton staff are well on their way toward analyzing and implementing solutions**

At the outset, we wish to thank City of Hamilton staff for facilitating tours and providing us with the information we requested. As we undertook our work we were able to observe staff initiatives addressing the problems associated with severe storm events.

For example, we were impressed with the progress the SERG group had made in the process of identifying a variety of stormwater management related issues, many of which were subsequently being addressed. Other policies and studies that we would have recommended were already being initiated or are in place. For example, the Urban Drainage and Design Guidelines are up-to-date. And, through Hamilton's GIS mapping and associated data base, it was clear that staff had an excellent and comprehensive knowledge of storm and sewer infrastructure and areas needing attention on a priority basis. Furthermore, ongoing CCTV monitoring of sewers provides great assistance in identifying areas of blockage or areas where sewers are in need of repair.

The Stormwater Management Master Plan is focused on reviewing storm sewer infrastructure and operating strategies and identifying potential upgrades to the system.

The Study is assessing 150 stormwater management ponds and is utilizing the 1-year and 10-year perspectives. The study is also evaluating stormwater management from the perspectives of quantity and quality. Furthermore, the Master Plan is addressing the long-term effects of an increase in growth with a forecasted 80,000 to 100,000 new Hamilton residents. Water quality management programs are being considered. The Master Plan is developing an overall stormwater management planning framework.

Overall, we were pleased to see the proactive efforts being undertaken by City staff and consultants to assess and recommend improvements to the City's stormwater management infrastructure and its operations and maintenance protocols. The Stormwater Management Master Plan, which addresses the separated sewer area only, is an important initiative and should set the framework for continued progress. It supports our efforts to address the causes and effects of severe storms, while at the same time,

providing recommendations to maintain and enhance existing stream system water quality.

From a larger urban planning perspective, the City of Hamilton is well on its way to completing its Growth Related Integrated Development process ("GRIDS"). This process has allowed Hamilton to take a leadership role in identifying complex problems associated with urban development, assessing them and developing cross discipline solutions. From a severe storm perspective, GRIDS allows Hamilton to take a long term assessment of the implications of land uses (such as effects of intensification and increased paved areas) as they relate to the effects of severe storms. Overall, the panel learned and accepted that the GRIDS process is seen to be a successful initiative and has become a model now used by other municipalities for innovative and effective planning.

The Panel learned about the Water and Wastewater Master Plan Study. Staff and consultants addressing by-passing issues pertaining to the Woodward Wastewater Treatment Plant appear to fully understand the problems caused by severe storm events. The Panel observed that the hydraulic model of the combined sewer system used for the Water and Wastewater Master Plan specifically addressed combined sewer overflow aspects and is not intended to address flooding at street and individual home levels. The model of the combined sewer system is sufficiently detailed for its intended purpose, which is to model combined sewer overflow volumes and overflow frequencies and assist in the sizing of CSO retention or treatment facilities. However, it was not intended to be detailed enough to evaluate potential sewer back-ups and basement flooding problems.

The Panel learned that the City may be able to build upon the existing combined sewer system model and augment and refine the model where necessary to evaluate the cause of the sewer back-up problems, to identify and evaluate potential remedial measures and to identify potential problem areas in the future. The future use of the model at a finer level of detail is recommended. In doing so, the model will be able to assist in identifying future areas at risk and predict areas where particular attention should be paid to the effects of stormwater on the combined sewer system.

Over the course of our deliberations, we were pleased to see that staff were already in the process of addressing many matters that would have been the subject of recommendations from the Panel. For example, studies for detailed extreme precipitation event characterization and for potential application of sophisticated monitoring and prediction of storms from sophisticated radar meteorology products were being considered as we were completing our work.

Technical studies underway are appropriate and progressive. Consultants are completing detailed analysis of the Mountview community (McCormick

Rankin) and are completing detailed topographic mapping of overall drainage route and undertaking calibration work. Additional studies on improving infrastructure will be required to address areas of east Hamilton, including Ward 4.

We observed that physical changes to address storm events are currently underway. On a priority basis, the City of Hamilton is retrofitting existing stormwater ponds.

Hamilton planning staff now assesses major and minor stormwater flow in evaluating new housing development proposals. It is appropriate that their analysis consider a broad range of circumstances that could affect stormwater flows: existing urban areas, rural areas, new urban development and the redevelopment of existing urban lands.

'Communications' is an important aspect of highlighting the risks that are associated with severe storms and mitigating potential damage. The Independent Community Panel observed that earlier communications efforts were well thought through. For example, the October 2005 brochure was well designed and informative, and this type of communication initiative must be continued and expanded.

While great progress is being made in identifying the causes and effects of severe storm events, the Independent Community Panel was able to recommend several areas where additional activity will yield improvements and benefits.

## 5. RECOMMENDATIONS

The Panel's recommendations are set out below, and are organized in the areas of engineering and design, urban design and planning, communications, and policy implementation. Hamilton is of a size that it can provide leadership and modest innovation as it plans for stormwater management. Following up on many of these recommendations will require commitments from both property owners and the City.

### 5.1 TECHNOLOGY, ENGINEERING AND DESIGN

#### **Due to climate change, it is prudent for Hamilton to adjust its planning to consider an increasing frequency of large storm events**

Some North American municipalities plan for the most severe storm events. Levees are constructed, large voluminous canals are built, and as a last resort, evacuation plans are put into place. A generation ago, Ontario municipalities completed severe storm infrastructure construction and design processes following the damage caused by Hurricane Hazel. Storm management measures were put into place by Ontario Conservation Authorities, and floodplain regulations were adopted to minimize risks to life and property that may occur as a result of severe storms.

Over the course of our deliberations we concluded that it would not be realistic for the City of Hamilton and most other Ontario municipalities to build infrastructure to address the most severe storm events. Even though most of Hamilton was able to cope with large volumes of rainwater fairly well, the cost of rebuilding the stormwater management system to convey all of the water from a 100-year storm would be significant.

We have concluded that due to the onset of the effects of climate change, it is prudent for the City of Hamilton to adjust its planning to consider a likely increase in frequency of severe storm events. Future design standards must address increased rainfall intensity. We therefore recommend that the City of Hamilton take an aggressive and proactive approach to stormwater infrastructure planning (**Recommendation 1**). This means that the City should take advantage of future opportunities to design for, or construct, the stormwater system to convey severe stormwater. This will involve an assessment of best return for expenditure of funds.

We also recommend that the City of Hamilton should place 'severe storms' on the City's emergency response list (**Recommendation 2**). To do this, the City would have to prepare its emergency response plan with severe rainfall storm events in mind.



### **There is no 'One Size Fits All' solution**

Each area of Hamilton has experienced different causes and effects of flooding. There is no single cause of flooding in any specific area. In light of this, the City should take an area-wide perspective and not only consider areas that are experiencing flooding and sewer back-ups now, but also consider neighbouring streets and neighbourhoods that may be affected 10 years from now (**Recommendation 3**).

### **The City should focus on the areas where there has been a history of flooding or severe back-ups in the past**

The areas where problems have been experienced in the past should be made a priority and appropriate studies initiated as soon as possible (**Recommendation 4**). Past problems in these areas may have been due to the magnitude of the storms, but the capacity or condition of the existing infrastructure may potentially have contributed to the magnitude of these problems. Appropriate studies should be carried out to ensure that whatever infrastructure improvements are necessary are identified and then implemented as soon as possible. In the separated storm sewer system areas, such studies would comprise storm drainage studies as are presently being carried out for the Mountview neighbourhood. In combined sewer areas, the present sewer hydraulic model should be made more detailed in these sewersheds (which include the areas most affected by sewer back-ups), and then used to determine required infrastructure improvements. The City should recalibrate its model at a finer level of detail and apply it to assess storm causes and effects at a neighbourhood level (**Recommendation 5**).

### **Both the Socio-Economic Benefits and Costs of Providing Infrastructure for Extreme Storms should be Evaluated**

Providing infrastructure designed for extreme storms mitigates the effects of such storms, but it can also have other, less desirable socio-economic impacts, for example, diverting funding from other City programs, disruption and inconvenience to local residents, etc. Therefore both the benefits and cost of providing an increased level of protection against extreme storms have to be taken into consideration and balanced against each other. The City should review the experience of other large municipalities in this area, and then evaluate the relative benefits and costs in Hamilton of a range of design standards (**Recommendation 6**). This will ensure that policy questions as to what are acceptable levels of risk (see Recommendation 23 and Section 5.2) can be discussed in an informed manner with access to the requisite data.

**Hamilton should continue to pursue engineered management solutions as well as implementing non-structural solutions such as the naturalization of potential overland flow routes and watercourses in support of stormwater retention**

The Independent Community Panel saw many instances of effective stormwater management by the City of Hamilton through the construction of stormwater management ponds. We also acknowledge that City staff and consultants are undertaking a careful examination of natural, non-structural ways to store or retain stormwater for longer periods through landscaping, enhanced plantings and soil conditioning. Ineffective stormwater management systems also need to be identified and corrected.

We recommend that the City study an aggressive approach to locating engineered stormwater management facilities in existing built-up areas, such as in the new Recreation Master Plan for Gage Park. We also recommend that the City be particularly aggressive in looking for opportunities to create water courses, recover former natural water courses, and complete stream remediation in existing urban areas (**Recommendation 7**). Watercourses and conveyance systems should be designed to replicate natural channel forms and processes with extensive planting to enhance bank stability, increase roughness and moderate flow rates.

The Independent Community Panel saw several opportunities to improve existing stormwater retention through natural landscape functions. For example, the stormwater management pond near the Chedoke Hospital, which was by-passed during one of the 2005 severe storm events, could benefit from further naturalization efforts. We observed that the soils could improve their ability to retain water. Additional trees could be planted, and inflow and outflow culverts could be reexamined to determine whether they are appropriately sized. As a case in point, we see an opportunity for the City of Hamilton's storm conveyance areas and stormwater detention ponds to be examined for their ability to use natural processes and functions (deciduous trees, absorbent soils, vegetation, etc.) to enhance their functional performance. In addition, the City should explore opportunities to increase the extent of canopy cover as a means to intercept rainfall and enhance evapotranspiration of runoff (**Recommendation 8**).

With respect to conveyance measures, we observed the City completing regular storm sewer maintenance, replacement of manholes and cleaning debris. We also encourage efforts toward downspout disconnections and eliminating CSO in older systems. Innovation in the installation of other stormwater conveyance measures would be welcome. For example, in areas that were flooded during the severe storm events, the City should, on a case by case basis, determine whether to install dual stormwater sewer grates and wider grates. It may be effective to convert single catch basins to double catch basins at appropriate key locations (**Recommendation 9**). All of these activities assist with the reduction of the effects of severe storms.

Hamilton already promotes a city-wide system of stormwater prevention measures. These include source control measures such as downspout disconnections, roof gardens and swales/ponds that act as biofilters. This is the right direction and we recommend that the City continue these efforts (**Recommendation 10**).

### **Hamilton should commit to the use of leading edge technology for better weather forecasting**

The Independent Panel noted that data used by staff were up to date and accurate. However, the Panel was informed that the current rain gauge network is temporary. Ten permanent gauges have been supplemented since 2004 by 9 temporary gauges, which have proven invaluable in the analysis of storms, flooding, modeling, monitoring and planning. Given the small scale of summer storms, even this 19-gauge network may not be adequate for capturing the spatial characteristics of such events.

The panel also learned that city staff were considering the utility of radar meteorology to evaluation of storms. Sophisticated radar-based tracking may be used to monitor storm development and progress on a finer spatial scale and shorter time scale than possible with the rain gauge network. If so, the contribution to real-time management of the storm- and waste-water systems might be considerable. The panel recommends that the City continue to support the exploration of this application to improve forecasting and operation of the water management systems.

The Panel recommends that the present network of gauges be maintained or expanded, but not contracted, and that the City continue to explore the application of sophisticated meteorological monitoring and forecasting technologies as they relate to storm-water management (**Recommendation 11**).

## **5.2 URBAN DESIGN AND PLANNING**

### **Urban design and planning should continue to be supported by broader adoption of watershed and sub-watershed system planning**

While Hamilton's urban developers currently need to complete stormwater management studies and sub-watershed studies, we feel there is an opportunity to take a broader perspective on the implications of large new urban developments. Impacts of these developments on major stormwater systems and sub-watershed systems need to be considered on a broader basis as urban development approvals are reviewed (**Recommendation 12**). In addition, the City of Hamilton should continue to consolidate the best stormwater management policies and actions from its former municipalities (**Recommendation 13**). The City should explore the

potential to implement new standards to enhance the use of at-source stormwater management initiatives. Relatively simple initiatives such as increasing the depth of topsoil required to be placed within new subdivisions can yield benefits in attenuating and/or moderating flows.

An inventory of areas previously impacted by severe storms, or with the potential to be impacted, should be developed and maintained. These areas should then be prioritized for action (studies, infrastructure improvements, etc.) using appropriate socio-economic ranking factors which reflect the severity of potential impacts on the residents and businesses. A comprehensive overall Flood Reduction Program should then be developed implemented and monitored taking into account the results of that prioritization (**Recommendation 14**).

### **Hamilton should continue to evaluate and implement capital expenditures and engineering initiatives in order of priority**

The Independent Community Panel observed that engineering work in some areas of the City will have higher priority than others in terms of capital expenditures and resultant benefits. As an example, the underpass at Kenilworth Avenue is frequently flooded during heavy rainfall events. The temporary closure of the underpass is the most effective solution to address the situation until funds for capital improvement are available. The City should focus on projects that return greater benefits for the funds expended (**Recommendation 15**). For example, the City should focus on sag points and depression areas, and should upgrade storm sewers where the existing situation results in flood damage to properties in the vicinity.

### **Work with residents and businesses to implement proactive stormwater impact avoidance measures**

We believe that residents and businesses can undertake private activities that would help eliminate the effects of severe storms. For example, some of the most severe effects could be eliminated through the installation of backflow preventers. We recommend that the City further enhance its current stormwater impact avoidance program and provide adequate staff support (**Recommendation 16**). We suggest an optimal program that would include cleaning storm drains, replacing swales and maintaining the function of the overland conveyance system, cleaning storm and sanitary sewer laterals should funding and staffing for such a maintenance program be available. It would include a demonstration project for the universal installation of backflow preventers and sump pumps, and provide training for residents and businesses. This program would be city-wide and would follow a strong communications program. It should be noted that a City By-law states that sewer laterals from the building to the street sewer are the responsibility of the homeowners to maintain. The only exception is for laterals structurally damaged on public property in which case the City can participate in a repair.

**For neighbourhoods vulnerable to flooding, Hamilton should undertake a pilot project of programs, practices and devices that limit stormwater damage**

Sump pumps and backflow preventers have potential to limit stormwater damage in the City of Hamilton. A pilot project to test the viability of sump pumps and/or backflow preventers should be considered in the areas most affected by stormwater, such as East Hamilton. A backflow valve allows waste to flow out from the home or business but blocks the flow of waste back into the property. The valve is inexpensive, while there is a moderate cost for professional installation. A sump pump pumps water away from the property when it exceeds an established level. The purpose of the program should be to demonstrate the benefits of using these devices, and to indicate any difficulties property owners experience in using them. The specific location of the pilot project and its scope and objectives need to be chosen carefully. The City must first confirm that flooding and sewer back-up problems are not due to deficiencies in the sewer system in order to ensure the credibility of the pilot program (**Recommendation 17**). The program would involve financing and installing these devices at a street level (**Recommendation 18**). We also recommend that the City only subsidize sump pumps if the sump is not pumping water into the sanitary system. Some training of property owners will be required. As a target, the City could aim to:

- Install backflow preventers for the length of a street (consistent with the physical alignment of the stormwater trunk sewer)
- Demonstrate various stormwater impact prevention measures at a Public Information Centre. Topics could include:
  - How to maintain back-flow preventers
  - Avoiding illegal connections
  - Respecting and renewing original overland flow conveyance routes
  - Maintaining swales
  - Reporting dumping
  - Checking for and cleaning up debris that obstructs stormwater catch basin inlets
  - Properly disposing of yard debris and grass clippings to ensure catch basins and sewers function correctly
  - Maintaining sewer laterals

### **5.3 COMMUNICATIONS PLAN**

#### **Hamilton should engage the local insurance companies and inform them of the storm impact and mitigation activities currently underway**

Given the potential risk to the City of Hamilton and its residents and businesses, the Independent Community Panel recommends that discussions occur with local insurance companies in the near future (**Recommendation 19**). The City should communicate activities it is undertaking and progress it is making to mitigate severe storm damage and minimize costly effects on insurance companies (i.e. the Flood Reduction Program). Together with the insurance companies, the City should determine an acceptable level of risk for Hamilton. The City should also encourage residents to report all flooding experiences to the City (**Recommendation 20**). The aim is to improve the data base of experiences. We heard that people may be reluctant to report flooding experiences for fear of insurance consequences, so there is a need for a bilateral or multilateral discussion with the insurers, the City, and the residents to work out a non-punitive system. Otherwise, the City will continue to work with incomplete information about the extent of the problems when they occur, affecting long-range design and planning.

#### **Hamilton should establish a more responsive manner of addressing complaints and insurance claims from residents**

The City has a responsibility to respond to complaints in a sincere and expeditious manner as sewage back-ups are a legitimate design problem. The City needs to build its own awareness of how and when insurance applies to residents and businesses, and then communicate to residents about what private insurance can and cannot do (**Recommendation 21**). There should be formal and proactive communication between Hamilton residents and the City on the matter of insurance, claims and compensation. Responsibilities and details of making an insurance claim should be clearly spelled out for residents. A Complaints Officer or ombudsperson would be helpful in completing this task.

The City should also develop better communication with insurance companies to inform them of the positive actions the city is undertaking. The availability and cost of sewer back-up insurance reflects the insurance industries confidence (or lack of confidence) in the City's sanitary sewer system. The City should be proactive to explain its efforts to reduce the risk of property damage for homes and businesses.

## **A communications plan should be developed and include the following elements**

At the specific community level, and if provided with the correct information, Hamilton residents can do a great deal to avoid some of the more severe effects of storm events on their properties. We are recommending a 'social marketing plan' as the core element of a communications plan (**Recommendation 22**). The social marketing plan will involve residents of affected areas working as a cohesive community. The Plan will encourage residents to become engaged in discussing, planning and participating in measures to prevent the effects of severe storm events. The Plan should follow in the footsteps of Edmonton's 'Flood Proof Program'. After experiencing severe flooding during the summer of 2004, Edmonton initiated this program to reduce the risk of basement flooding due to sewer back-up during rainfall events, and to reduce the risk of wet weather flows in the sanitary sewer system. The program included a home flood prevention check-up, a public information campaign and a neighbourhood education initiative.

The communications plan that Hamilton adopts should be city-wide and should encourage residents to take proactive efforts to avoid future flooding events (**Recommendation 23**). The following should be considered for inclusion (as budgetary constraints allow) in a comprehensive communications plan, which should utilize the City's website, inserts into the Hamilton Spectator, and other appropriate methods of disseminating information:

- Inspecting homes for improper design of basements and connections. Some basements may be too low to provide for gravity flow to the storm sewer system
- Distributing information about the frequency of high-intensity storms that Hamilton residents can expect that may cause property damage and/or sewer back-ups, with the uncertainty of such estimations emphasized
- Providing information on stormwater and the potential impacts of severe storms (similar to that currently provided on the City's website on CSOs<sup>12</sup>)
- Disseminating information about the acceptable level of risk that Hamilton is willing to adopt in its decision making; regarding severe storms such discussions should be done in consultation with the public

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<sup>12</sup>

[http://www.myhamilton.ca/myhamilton/cityandgovernment/citydepartments/publicworks/water/combinedseweroverflow\(cso\).htm](http://www.myhamilton.ca/myhamilton/cityandgovernment/citydepartments/publicworks/water/combinedseweroverflow(cso).htm)

- Calling the City before altering swales, drainage ditches, and other stormwater run-off areas on properties
- Checking properties for blocked drains each spring and throughout the summer
- Communicating to residents that, if you've experienced flooding once, you will experience it again – work with the City to fix the problem
- Describing the various private insurance and public relief programs available to property owners who experience sewer back-up or flood damage
- Encourage residents to regularly review their insurance coverage with an insurance professional to ensure appropriate coverage is in place
- Undertaking other proactive efforts to address storm impacts

**Hamilton should prepare a stormwater impact avoidance brochure for residents and businesses to complement the communications plan**

The City of Hamilton has already had some success with its October 2005 stormwater newspaper insert. Building on this success, we recommend that a comprehensive brochure be produced and distributed throughout the City (**Recommendation 24**). The proposed brochure information could be presented in a series of brochures. Among other topics, it is recommended that the brochure(s) should address:

- Hamilton's challenge is to reduce and alleviate the potential for stormwater damage, but it is not possible to attain complete elimination of risk
- On climate change, heavy storms will increase but we cannot predict the effects – so we need to take a precautionary approach
- The roles and responsibilities of the City, homeowners and businesses, and the insurance industry
- Types of tenant, homeowner and business insurance available
- How to minimize the number of valuable items at risk (unfinished basements, for example, are at less risk than finished basements)
- Who to phone if there is damage
- How to avoid stormwater damage through prevention technology



- Back-flow preventer valves and how to install and maintain them
- Sump pumps and how they work to avoid back-ups
- Landscaping and installation of physical solutions such as French drains and flow diversion trenches
- Flooding effects that arise from more recurrent storms (not the severe storms)
- Information about the City of Hamilton's new Compassionate Grant relief program, including eligibility criteria.
- What are CSO tanks and how do they function?

#### **5.4 POLICY AND IMPLEMENTATION**

##### **Communications methods should constitute a continuing program, repeated at regular intervals**

Led by City Council, the City should consider engaging its residents and businesses in a community-wide discussion about policy questions (**Recommendation 25**). Discussions with residents and businesses could include the following policy topics:

- Acceptable level of risk
- Which rainfall return period should be used, and at what cost
- Process the City should adopt for addressing residents, agencies and businesses that are not insured, underinsured or no longer qualify for insurance
- Hamilton's liability for sewage back-up, and for severe storms when private insurance is not available
- Implementing an area-wide planning process to address the causes and effects of storm events

##### **A Medical Officer of Health should be engaged in the discussion of health effects**

The Panel heard concerns about health effects due to mold, mildew, feces and bacteria. It was not in the Panel's Terms of Reference to address potential health impacts, but the Panel recommends that the City engage its Medical Officer of Health to provide advice to residents (**Recommendation 26**). The public needs to be educated about the proper removal and clean-up of sewage back-up waste and flood waters, and the potential health risks of not responding to sewage back-ups appropriately.

## 5.5 Summary of Recommendations

The following is a summary of the Panel's recommendations.

**Recommendation 1** – The City of Hamilton should take a proactive approach to designing for severe storm events and take advantage of cost effective opportunities when they arise as part of future stormwater infrastructure planning.

**Recommendation 2** – The City of Hamilton should place 'severe storms' on the City's emergency response list.

**Recommendation 3** – The City of Hamilton should take an area-wide perspective of the effects of climate change and severe storms. In addition to considering areas that are experiencing flooding and sewer back-ups now, also plan for surrounding streets and neighbourhoods that may be affected 10 years from now.

**Recommendation 4** – The City of Hamilton should make areas where problems have been experienced in the past a priority for investigation and appropriate actions.

**Recommendation 5** – The City of Hamilton should recalibrate its model at a finer level of detail and apply it to assess storm causes and effects at a neighbourhood level.

**Recommendation 6** - The City of Hamilton should evaluate both the benefits and costs of providing infrastructure to accommodate extreme storms so that policy discussions are carried out in an informed manner, recognizing both the positive and negative impacts.

**Recommendation 7** - The City of Hamilton would benefit from becoming more aggressive in looking for opportunities to create water courses, recover former natural water courses, and complete stream remediation in existing urban areas.

**Recommendation 8** – The City of Hamilton's storm conveyance areas and stormwater detention ponds should be examined for the ability to integrate non-structural initiatives and natural processes and functions.

**Recommendation 9** – The City of Hamilton is encouraged to assess, on a case by case basis, opportunities to improve stormwater infrastructure, such as converting single catch basins to double catch basins at appropriate key locations.

**Recommendation 10** – The City of Hamilton is encouraged to continue to promote city-wide stormwater effect prevention measures at a household level.

**Recommendation 11** – The City of Hamilton ought to commit to maintaining or intensifying the density of the rain gauge network and to the use of leading edge technology for better weather forecasting and make the gauge network permanent.

**Recommendation 12** - The City of Hamilton should continue to look carefully at the impact of urban developments on major stormwater systems and sub-watershed systems on a broader basis as urban development approvals are reviewed.

**Recommendation 13** – The City of Hamilton should continue to amalgamate and consolidate the best stormwater management policies and actions from former municipalities.

**Recommendation 14** – The City of Hamilton should consider developing a comprehensive, overall Flood Reduction Program to mitigate the impacts of severe storms, placing a priority for action in the neighbourhoods most at risk

**Recommendation 15** - The City of Hamilton should focus on capital expenditure projects that return the greatest benefits for the funds expended.

**Recommendation 16** – The City of Hamilton should enhance its stormwater impact avoidance program and provide adequate staffing if funding is available.

**Recommendation 17** – The City of Hamilton should consider undertaking a pilot project to address areas affected by stormwater. Before implementing the program, the City must first confirm that flooding and sewer back-up problems are not due to deficiencies in the sewer system.

**Recommendation 18** – The pilot project should involve the financing and installation of backflow prevention devices at a street level.

**Recommendation 19** – The City of Hamilton should engage in discussions with local insurance companies about the efforts it is taking to address storm effects.

**Recommendation 20** – The City of Hamilton should encourage residents to report all flooding experiences to the City and enhance its ability to respond effectively.

**Recommendation 21**– The City of Hamilton should build its own awareness and then communicate to residents on what private insurance can and cannot do.

**Recommendation 22** - The City of Hamilton should undertake a 'social marketing plan' as the core element of a communications plan.

**Recommendation 23**– The communications plan that Hamilton adopts should be city-wide and should encourage residents to take proactive efforts to avoid future flooding events.

**Recommendation 24** – The City of Hamilton should produce and distribute a comprehensive stormwater impact mitigation brochure.

**Recommendation 25** – The City of Hamilton should engage its residents and businesses in a community-wide discussion about policy questions.

**Recommendation 26** – The City of Hamilton should engage its Medical Officer of Health to provide advice to residents.

## 5.6 Engaging residents in policy discussion

The following is a list of policy issues that the Panel recommends be considered by the City of Hamilton as they continue to engage residents in the discussion of flooding and sewer back-ups.

- Where should Hamilton situate itself as it assesses its performance of stormwater and sanitary sewer systems against other major urban centres in Canada? (i.e. "benchmarking")
  - Are the design criteria for the systems in line with best municipal practices?
  - Are sufficient resources available for maintenance, repair and upkeep?
  - How does the frequency and extent of flood damage and failure of the sanitary sewer system in Hamilton compare with other communities?
- What should Hamilton identify as an acceptable risk that the stormwater management system may be overwhelmed and cause some damage to property?
  - Should residents expect flood damage somewhere in Hamilton once a year? Once a decade? Once a century?
- What should be an acceptable level of risk that the sanitary sewer system may fail and bring waste into homes and businesses?
  - Should residents and businesses expect the sanitary system to fail somewhere in Hamilton once a year? Once a decade? Once a century?
- Over what period should the City adopt to upgrade its infrastructure, where necessary, to meet those levels of risk?
- What action should the City take if it finds cross connections between the stormwater and sanitary sewer systems in areas where the systems are intended to be independent?
- Should Hamilton introduce a subsidy program to encourage residents to invest in back flow preventers and other protective mechanisms?
- Should Hamilton compensate property owners who experience damage when the sanitary sewer system fails?
  - Should compensation be available only to property owners who can demonstrate that private insurance was not available, perhaps because the sanitary sewer system failed in the past and insurance companies were not confident that the risk had been addressed by the City?

- Or should compensation also be provided to property owners who choose not to buy sewer backup insurance although it was available?
- Should sewer back-up damage compensation from the City cover only damage to essential items, like the Provincial flood damage compensation program?

# **APPENDIX A – Council Resolution**

Resolution 7.2 City of Hamilton  
September 1, 2005

# **APPENDIX B – Terms of Reference**

Independent Community Panel  
Terms of Reference

## **CITY OF HAMILTON – STORM RESPONSE TERMS OF REFERENCE INDEPENDENT COMMUNITY PANEL**

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### **Introduction**

During the summers of 2004 and 2005, the City of Hamilton experienced heavy rainstorms that left parts of the City flooded<sup>13</sup>. As a result of the flooding, many City of Hamilton residents have been affected by property damage and financial losses totaling hundreds of thousands of dollars. The communities of Woodward, Westmount, East Gage Park and residents in the area of the Chedoke Hospital were particularly hard hit.

### **Mandate**

In response to this situation, the City has asked that an Independent Community Panel be established to review the causes, effects and outcomes of storm events and make recommendations to Hamilton City Council. The Independent Community Panel will conduct its activities within the context of the Stormwater Management Master Plan and Water and Wastewater Master Plan currently being conducted by the City of Hamilton as part of the Growth Related Integrated Development Strategy ('GRIDS') process.

### **Responsibilities**

The Independent Community Panel will:

1. Address the causes and effects of inclement weather on the storm management/ drainage systems in the City;
2. Establish a communication strategy to assist in educating the general public on issues concerning risk management, compensation, etc;
3. Comment on the draft City of Hamilton Stormwater Management Master Plan;
4. Review insurance issues and consult with the insurance industry.

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<sup>13</sup> Storms of June 1, 2004; July 26<sup>th</sup> 2005 and August 19, 2005



## **Duration**

The Independent Community Panel will conduct its activities and make recommendations to City of Hamilton Council by June 30, 2006. Unless the Term of the Independent Community Panel is formally extended through resolution of Council, the Independent Community Panel will conclude its activities and be disbanded on July 14<sup>th</sup>, 2006, or two weeks following City Council's acceptance of the memo listing recommendations of the Independent Community Panel, whichever comes last.

## **Membership and Conditions of Appointment**

The Chair and Members will sit at the pleasure of the City of Hamilton. The Independent Community Panel will consist of five members, one each from the following sectors: community storm management; insurance industry; climatology; wastewater management; and other related fields. City staff will provide assistance to the Independent Community Panel and the Panel will report to Council through the Public Works, Infrastructure and Environment Committee.

- 1. Chair** – One of the five members of the Independent Community Panel will be appointed as Chair. The Chair will set the agenda, conduct Independent Community Panel meetings in a timely and orderly manner and ensure that the meeting adheres to the agenda items. The Chair will help the Independent Community Panel achieve consensus where possible and will ensure that each member has the opportunity to provide input and opinion. It will be the responsibility of the Chair to present the Panel's recommendations to Council.
- 2. Members** - All members of the Independent Community Panel will represent their individual and independent interest. Members are encouraged to work with each other to develop consensus recommendations. Members may not appoint alternates. For illness, absence or other reasons, the City of Hamilton through staff, after discussion with the Chair, may replace a member of the Independent Community Panel at any time.
- 3. Observers** – It will be the sole discretion of the Chair as to whether observers are allowed to participate in meetings of the Independent Community Panel. Unless decided otherwise by the Chair, observers will not participate, not ask questions or provide unsolicited comments.
- 4. Resource Staff** – City of Hamilton staff will act as a resource to the Independent Community Panel. Staff may sit with the Panel as ex-officio non-voting members. Resource staff will provide technical, risk

management and environmental information and respond to questions from the Independent Community Panel.

### **Selection and Replacement of Chair**

The Chair will be selected by City of Hamilton staff. For illness, absence or other reasons, the City of Hamilton as represented by staff, may replace the Chair of the Independent Community Panel at any time.

### **Panel Procedures**

The Independent Community Panel is an advisory group to the City of Hamilton. The Panel will undertake activities and complete inquiries that will provide its members with information about the cause and effect of inclement weather on the storm management/ drainage systems in the City. The Panel will discuss and develop a communications strategy that will assist in educating the general public on issues concerning risk management, compensation, etc. It will liaise with staff and consultants and comment on the draft City of Hamilton Stormwater Management Master Plan. The Panel will review insurance issues and consult with the insurance industry. Based on these actions, the Independent Community Panel will make recommendations and present them in memo format to Hamilton Council.

All participating members will have an opportunity to be heard, and dialogue and deliberations of Panel members will be conducted in a professional and respectful manner. Members should review any reports and materials before the meetings. Members should be courteous, listen to others and respect the opinions of others. Members should participate fully in discussion but not dominate the discussion or allow others to do so.

Private discussions should be held outside of Committee meetings. Members should not make derogatory comments of any kind or claim to represent or speak for the City of Hamilton.

### **Protocol for Decision Making**

A quorum consists of three members. In general, decision making through voting is discouraged. The Chair will decide whether and when matters can be voted upon. From time to time the Independent Community Panel Members may be asked to assist with decisions of an administrative matter, such as the time, date and location of meetings. Decisions will be made by consensus where possible. In the absence of consensus, and when the Chair allows a vote to be taken, decisions will be made by majority vote. Where votes are allowed by the Chair, each participating member will have one vote.

## **Interim Schedule of Activities**

The Independent Community Panel will develop its own schedule of meetings. The two initial meetings of the Panel are scheduled for 7:00 pm at City Hall date T.B.A. The meeting room is to be scheduled.

## **Administrative Support**

The City of Hamilton will provide the Independent Community Panel with the following resources:

1. Meeting facilities
2. Services of resource staff
3. Technical information concerning stormwater management issues.

## **Communications Protocol/ Consultation**

Members of the Independent Community Panel will communicate through the Chair on matters requiring external communications. This pertains to, but is not limited to, communications with City of Hamilton Council, staff, members of the public and media. Communications with consultants will occur through City of Hamilton staff. At its member's discretion, the Panel may consult City of Hamilton residents on matters related to unique storm events.

## **Privileged Information and Confidentiality**

It is recognized that occasional conflict may arise between the mandate of the Panel and the interests of the City's liability insurers. The ability to claim privilege over information and documents in defence of a lawsuit may be compromised once they are provided to the Panel. In order to avoid placing the City's liability coverage in jeopardy, it may be necessary for the City to claim privilege over information and documents requested by the Panel, or to disseminate certain information and documents to the Panel in accordance with Freedom of Information legislation and/or the Rules of Civil Procedure.

Panel members are expected to handle confidential information and documents they do receive in accordance with Protection of Privacy requirements.

## **Declaration of Conflict of Interest**

It will be up to each member of the Independent Community Panel to assess and report whether he or she has a conflict of interest regarding any matter being addressed by the Panel. Should conflicts of interest or perceived

conflicts be apparent, it will be the responsibility of each Panel member to declare the conflict of interest and then, working with the Chair, take actions required to remove the conflict.

### **Remuneration and Reimbursement of Expenses**

Participation of Panel Members will be voluntary. Panel members will be reimbursed normal out of pocket expenses associated with participating on the Panel, such as travel, parking, etc.

### **Attendance**

Approximately 8 meetings are anticipated between January and June 2006. Panel members shall be expected not to miss any more than two consecutive meetings.

### **Changes to Terms of Reference**

City of Hamilton will have sole responsibility for changes or alterations for changes to the Terms of Reference.

**Draft: Terms of Reference: 28 November, 2005**  
**Rev. 1 24 January, 2006 – change date of first two meetings.**  
**Rev. 2 10 February, 2006 – amend Privacy and Confidentiality provisions**

# APPENDIX C - Compassionate Grant Policy

## ELIGIBILITY CRITERIA

### FOR

## RESIDENTIAL MUNICIPAL DISASTER RELIEF ASSISTANCE PROGRAM FOR BASEMENT FLOODING

### Introduction

The eligibility and payment of any funds under the program is based on compassionate grounds only and is not to be construed as an admission of liability on the part of the City of Hamilton. Any funds paid under this program will be deducted from any potential future claim settlement to avoid duplication of damage payments. This program would not be implemented where disaster relief is provided by another level of government (e.g., ODRAP). In addition, residents who are currently in litigation with the City would not be eligible for assistance under this program.

### Disaster Declaration

To declare a Disaster resulting from a severe rainstorm event, Council shall, by resolution, clearly define the time frame and identify the boundaries within the City that are eligible for relief for basement flooding under this program.

### Eligibility

To be eligible, the following criteria must be met:

- Residential property must be within the boundaries of the declared disaster area and suffered basement flooding directly related to the severe rainstorm event
- Losses not covered by insurance
- Private residential owners and/or tenants
- Damages fall into the categories of eligible losses & costs

### Eligible Losses and Costs

- Clean-up, restoration, repairs or replacement to pre-disaster condition to the basement of a principal residence
- Essential furnishings including refrigerator, freezer, furnace, stove, clothes, washer and dryer
- Tools or other items essential to the claimant's livelihood
- Emergency expenses (e.g., evacuation costs, food and shelter)
- Perishable food
- Insurance deductible

### **Ineligible Losses and Costs**

- Losses covered by insurance
- Non-essential furniture (e.g., stereos)
- Landscaping, fencing, driveways and retaining walls
- Recreational vehicles (e.g., boats)
- Antiques and collections
- Loss of revenue or wages (e.g. rents)
- Losses recoverable at law
- Personal injury
- Private roads/bridges and erosion

### **Private Property Owners**

Eligible losses include:

1. Costs of clean-up, restoration, repair or replacement to pre-disaster condition of a basement (e.g., floors and walls).
2. Costs for clean-up of property for safety reasons or to provide access (e.g., debris removal); and
3. Costs of clean-up, restoration, repair or replacement of basic furniture damaged as a result of the disaster (e.g., major appliances).

### **Tenants**

Eligible losses include:

1. Costs of clean-up, restoration, repair or replacement of contents as identified in the Eligible Losses and Costs damaged as a result of the disaster (e.g., major appliances and beds but excluding structural repairs that are the responsibility of the owner).

### **Limitations**

Applications for a compassionate grant under the Residential Municipal Disaster Relief Assistance Program must be received by the City and/or its agent no later than 4 months (120 days) from the date that the event was declared a disaster by City Council.

Only one application for each residential property is eligible except where the property is occupied by a tenant in which case the owner may also be eligible.

## APPENDIX D – Experience of Other Cities

### Peterborough

In July 2004, the City of Peterborough experienced a severe rainfall event that resulted in a very high level of flood damage. Over \$100 million in direct physical damages to private and public property resulted, in addition to indirect damages such as disruption in residential living conditions, loss of business, and loss of wages or income.

Shortly after the flood, the City retained UMA Engineering Ltd. to undertake a strategic city-wide assessment of its urban drainage and sewer systems. This report, known as the Flood Reduction Master Plan, provided a high-level overview of the causes of flooding and identified remedial measures to improve the operation of the drainage system and reduce the risk of damage from future flooding.

The Master Plan recommended specific tasks and programs, including:

<b>Task / Program</b>	<b>Purpose</b>
<i>Information Gathering and Field Work</i>	
Flow Monitoring and Rainfall Monitoring	Collect accurate, current information on the flow characteristics of the study area, and the associated rainfall intensity, total volume, rate, and duration
Smoke and Dye Testing	Identify roof downspouts and catch basins cross connected to the sanitary sewer and cross connections between the sanitary and storm sewers
Soils and Groundwater Investigation	Identify areas of high water table and soil permeability and to understand soil runoff characteristics
CCTV Inspection of Pipes	Inspect and evaluate storm and sanitary sewers identified as priorities
<i>Detailed Study and Environmental Assessment</i>	
Detailed Storm and Watercourse Flood Reduction EAs	Identify the severity and frequency of flooding, and associated damages within each catchment area  Identify and assess alternative and cost effective solutions based on flood reduction, erosion and water quality effectiveness

<b>Task / Program</b>	<b>Purpose</b>
City-Wide Policy Review	Recommend new development standards and practices based on a detailed review of existing standards and practices used in other jurisdictions.  Review and recommend changes to the City of Peterborough's existing land use controls, including the review of relevant bylaws, policies, and development standards to prevent the flooding of private property
Emergency Preparedness and Response	Review the management of the July 2004 flood and improve the City's current Emergency Management Plan, including coordination with other stakeholders
Public Awareness Program	Heighten City-wide public awareness on actions and activities to reduce the risk of future flood damage
Detailed Sanitary Sewer EA	Reduce basement flooding with sanitary sewage by reducing the unwanted flows into the sanitary system
<i>Project Implementation</i>	
Flood-Proof Private Property	Reduce the impact of basement flooding damage from sewer back-up and overland flow, and other damage
Disconnect Foundation Drains	Develop a phased disconnection program to reduce damages from basement back-ups and sanitary sewer overflows
Seal Manhole Covers	Develop a phased disconnection program to reduce extraneous flows
Install Backflow Preventers	Reduce the impact of basement flooding damage from sewer back-up and overland flow, and other damages

Following completion of the Master Plan, the City hired a Flood Reduction Program Manager to lead and manage the Master Plan implementation, including overall budget control and coordination. The City has since initiated a study of one of the area's watersheds to identify solutions that will reduce the risk from future flooding. The City has also approved the establishment of an interim municipal sewer backflow prevention subsidy program for properties affected by the July flood.



## Edmonton

Edmonton also experienced considerable rainfall in July of 2004, leading to the flooding of 4,000 homes. This event prompted the City's Drainage Services to make flood prevention a top priority. Drainage Services' flood prevention strategy has three key goals:

- Find the main causes of flooding in at-risk neighbourhoods,
- Identify options for reducing the risk of flooding in the future, and
- Work with communities and other stakeholders to implement viable solutions that improve flood prevention.

In response, staff presented a detailed flood prevention implementation plan for high-risk neighbourhoods to Edmonton City Council for funding consideration in the fall of 2005. The result was *Flood Proof*, the City of Edmonton's Drainage Services Flood Prevention Program. The Flood Proof Program is intended to reduce: (a) the risk of basement flooding due to sewer back-up during rainfall events, and (b) wet weather flows in the sanitary sewer system.

Components of the *Flood Proof* program include:

Component	Purpose
Home Flood Prevention Check-up	This free program helps homeowners identify and resolve drainage deficits on their property in order to minimize the risk of flood damage to their homes. Upon request, drainage specialists will consult on-site with a residential homeowner, do a drainage assessment and provide recommendations.
Public Information Campaign	The City launched an extensive advertising and promotions campaign in early May 2005, which included brochures, print ads and TV advertising, articles and features in various publications, and direct mail information updates to interested stakeholders and community leaders.
Neighbourhood Education Initiative	This initiative provides educational displays in high visibility areas (malls, libraries) and flood prevention workshops/presentations for local residents, including one such workshop on backwater valves. The City also prepared and circulates <i>The Homeowner's Guide to Flood Prevention</i> .

## **Toronto**

Toronto experienced the same severe storm as Hamilton experienced on August 19, 2005, when more than 150 mm of rain fell in a three-hour period, causing many basements to flood in the northern part of the city. At the time of the flooding, the City had already begun to implement the recommendations of the Wet Weather Flow Management Master Plan, which was approved by Council in 2003.

One of the priorities of the plan is protecting homes from basement flooding. The Basement Flooding Remediation Program identifies remediation works based on areas identified from a storm in May 2000 and the more recent events of August 2005. Residents also have access to short-term programs such as providing a subsidy on the installation of a backflow valve plus a sump pump and free inspection of house lateral for blockage.

Homeowners who experienced basement flooding during the August 19, 2005 storm were eligible for a subsidy as part of the Basement Flooding Protection Subsidy program. The program covers the installation of flood-prevention devices, including a back-water valve, a sump pump, downspout disconnection and pipe severance and capping, to help reduce future flooding incidents.

The Master Plan also calls for eliminating discharges from combined sewer overflows in older parts of the city. Toronto Water conducted a physical assessment of existing storm and sanitary sewers in areas of the City where basement flooding occurred during the August 19, 2005 storm.