City of Greater Sudbury

DEVELOPMENT OF TRAFFIC CALMING POLICY & PILOT PROJECT REVIEW FOR SOUTHVIEW DRIVE / BOUCHARD STREET
CURRENT BEST PRACTICES

DRAFT TECHNICAL MEMORANDUM #1

APRIL 2008

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1. INTRODUCTION

As the need and justification for traffic calming and remedial measures varies considerably from one jurisdiction to the next, a number of jurisdictions have developed their own traffic calming 'warrants' based on traffic/pedestrian volumes, operating speeds, collisions/conflicts and a number of other factors. Much like traffic signal warrants, traffic calming warrants provide guidance for the appropriateness and implementation of traffic calming measures. In most cases, the warrants were developed to quantify the perceived problems that residents raise in their traffic calming requests. In many jurisdictions, the warrants go beyond a simple minimum score required for traffic calming and also offer a means to rank and prioritize potential traffic calming sites through secondary evaluation criteria, as well as offering guidance for the installation of appropriate traffic calming measures.

1.1 Study Background and Objectives

The City of Greater Sudbury currently has no formal policy with which to respond to, assess and address traffic calming issues raised by residents and key stakeholders. The overall objective of this study is to develop a traffic calming policy for the City. This study will build on the foundation of other jurisdictions to develop a traffic calming warrant and policy that provides appropriate guidance for the implementation of traffic calming measures in the City of Greater Sudbury.

The four tasks associated with the study are:

- Review current best practices with respect to traffic calming devices, warrants and policies;
- Develop a comprehensive traffic calming warrant that can be applied to requests received by the City;
- Develop an appropriate traffic calming policy for the City; and
- Undertake a traffic calming pilot project for Southview Drive / Bouchard Street that is consistent with the recommended traffic calming policy;

1.2 Document Purpose

The purpose of this document is to review best practices of jurisdictions throughout North America in the area of policy and warrants that evaluate, rank and prioritize traffic calming requests. The review will lay the foundation for an appropriate traffic calming policy for the City of Greater Sudbury.

Specifically, the review analyzes the state of traffic calming in Ontario, elsewhere in Canada and in the United States. Several jurisdictions are reviewed under each category. As it is infeasible to review the practices of every North American municipality that has implemented a traffic calming policy, these communities represent the forefront of traffic calming (through early adoption, unique practices or number of implementation sites), or they may share similar characteristics with Sudbury, e.g. similar size and/or setting.

2. REVIEW OF BEST PRACTICES

Transport Canada has identified a list of Canadian municipalities with significant traffic calming experience. The list, presented in **Exhibit 2-1**, was used as a starting point for the best practices review.

Exhibit 2-1: Canadian Municipalities with Significant Traffic Calming Experience

Municipality	Detailed Policy or Guidelines	Project Focus		Municipality	Detailed Policy or Guidelines	Project Focus	
		Street	Area			Street	Area
Alberta				**Nova Scotia**			
City of Calgary	■		■	Halifax Regional Municipality	■*		■
City of Edmonton			■	**Ontario**			
British Columbia				City of Toronto	■	■	
City of Burnaby			■	City of Ottawa	■*		■
City of Coquitlam	■		■	City of Waterloo	■	■	
Corporation of Delta	■		■	Town of Oakville	■		
City of Kelowna	■*		■	Town of Markham	■*		■
City of Langley	■		■	City of Pickering	■		■
City of North Vancouver	■		■	City of Vaughan	■		■
City of Port Moody	■	■		City of Windsor	■		■
District of Saanich	■		■	**Quebec**			
City of Surrey	■		■	Gatineau	■		■
City of Vancouver	■		■	Montreal			■
City of Victoria			■	Sherbrooke		■	
District of West Vancouver	■	■		Quebec			■
Manitoba				**Saskatchewan**			
City of Winnipeg	■+	■		City of Saskatoon			■
New Brunswick							
City of Fredericton	■		■				

* Component of broader policies or guidelines for traffic management or road safety

\+ Limited to the use of speed humps

Traffic Calming in Canadian Urban Areas. Transport Canada. May 22, 2007. March 24, 2008. <http://www.tc.gc.ca/programs/Environment/UTSP/trafficCalming.htm>

2.1 Ontario

Many major cities and population centres in Ontario use traffic calming to mitigate the negative effects of traffic within their neighbourhoods. These communities typically have official traffic calming policies, and most of them follow a warrant process for screening and prioritization. Some examples from Ontario are discussed below.

2.1.1 TORONTO

The City of Toronto has implemented traffic calming on existing roadways and laneways for a number of years. In February 2002, City Council adopted a new Traffic Calming Policy, which supports the on-going implementation of traffic calming on local and collector streets where local community support exists, existing traffic impacts are significant and where emergency and transit vehicles can be reasonably accommodated. There has been a steady increase in the demand for traffic calming installations in the City of Toronto. Accordingly, Toronto's policy includes a ranking system to prioritize potential projects. Primary retrofit traffic calming devices used in Toronto are curb extensions and speed humps. There are a limited number of cases where traffic calming has been secured or stipulated as part of the development approvals process, i.e., Deer Park Area. Other policy highlights include:

- Consideration of traffic calming on a street can be initiated by the local Councillor following a public meeting or upon a receipt of a petition signed by 25% of the affected residents. In the case of multiple family rental dwellings, receipt of a petition of 10% of the affected residents;

- Toronto has established a number of traffic calming warrants to determine:

  - The support needed to undertake a traffic management plan study;

  - Safety requirements including sidewalk, road grade and emergency response; and

  - Technical requirements including prevalent operating speeds, minimum and maximum traffic volumes, minimum block lengths and transit service.

- The priority ranking system is based on speed, volume, collisions, and pedestrian and bicycle factors, as a function of roadway type;

- The City uses many of the traffic calming measures outlined in the *Canadian Guide to Traffic Calming* (TAC, 1999); however, it also uses edge lines, parking and "parking islands" as non-physical means of addressing traffic concerns; and

- Through a ballot process, 60% support from 51% or greater of the affected households is required to support the project.

There have been a limited number of cases where traffic calming devices have been removed from City of Toronto roadways due to design and aesthetic reasons. It should be recognized that these were older installations that were implemented when traffic calming in North America was in its infancy and comprehensive guidelines and public input mechanisms were not readily available.

2.1.2 OTTAWA

The City of Ottawa implements traffic calming measures as part of a broad Area Traffic Management program. Other measures within the program include enforcement, education, transportation demand management and regulation. The City has developed extensive principles and procedures surrounding the concept of equity for all users of City roads. The Ottawa program is too detailed for full exploration within this report. Instead, this section will focus on the screening and prioritization process used by the City.

Initial requests for traffic management must come from one of three categories:

- At least 10 households or businesses or 25% of the homes/businesses of the affected area;
- The City Councillor for the ward; or
- The community association, school council, or business association for the area.

All requests then follow the same process. Some requests can be addressed through a 'quick fix,' such as replacement of a missing sign or an increased enforcement campaign. Another category of requests needs to be referred to other City departments. The remaining requests are subject to the Area Traffic Management Project Screening. The screening process requires the City to collect a variety of traffic data and apply it to a three-step screening process, as described in **Exhibit 2-2**.

Exhibit 2-2: City of Ottawa Traffic Management Screening Process

	Screening Results (complete tests 1 and 2 listed below)
Yes/No	One serious collision involving a vulnerable street user within the past three years
Yes/No	At least ONE of the Context Criteria and at least TWO of the Traffic Criteria met. (See Test One and Test Two below)
If either of the above is answered with YES, the issue is carried forward as a project.	

Test One - Context Criteria: the street/area must have the proper context, demonstrating susceptibility to negative impacts associated with traffic by meeting at least one of the following criteria:

Check All that Apply	**Context**
	Presence of schools, parks, community centres, or cluster of vulnerable street users (e.g. care facility, childcare centres, seniors' residences)
	Primarily residential frontage.
	Pedestrian activity levels which are not adequately served by pedestrian facilities.
	Pedestrian-oriented retail (e.g. "main street" district).

Test Two - Traffic Criteria: the City will collect or extract from its records sufficient data to determine if at least two of the following indicators are satisfied:

Meets Threshold (Check all that apply)		**Indicator**	**Measure**
Local or Collector	**Arterial**		
		Inappropriate driver behaviour	There must be clear evidence of inappropriate driver behaviour, characterized by a history of complaints and verified through enforcement efforts.

		Speed	15% of vehicles are traveling at or above 50 km/h unless the street is posted at a higher speed limit, in which case 15 % of vehicles must be traveling at or above the posted speed limit (i.e. same as the 85th percentile measurement). - or - 5% of vehicles are traveling at or above 60 km/h, unless the posted speed is higher than 50 km/h in which case 15 % of vehicles must be traveling 10 km/h or more above the posted speed limit (i.e. same as 95th percentile measurement).
	N/A	Volume	The average motorized traffic volume is at least: – 1000 vehicles per day or 120 vehicles per peak hour, if the street is a local street – 2500 vehicles per day or 300 vehicles per peak hour, if the street is a collector street – 5000 vehicles per day or 600 vehicles per peak hour, if the street is a major collector street
	N/A	Through traffic volumes	There must be tangible evidence of "through" traffic (defined as motorized vehicles using a lower classification road during an intermediate portion of a trip) exceeding 20% of the total traffic volume. Through traffic may include vehicles circling a neighbourhood to find parking.

Exhibit 3-4 Sample - Screening Checklist. City of Ottawa. March 24, 2008.
<http://www.ottawa.ca/residents/onthemove/driving/traffic/atm/exhibits/ex_3_4_en.html>

If a request satisfies the screening criteria, the next step is to categorize it as a localized or comprehensive study, as follows:

- Localized Studies:
  - Confined to one or few streets;
  - Local, collector or major collector streets (i.e. no arterials);
  - One clearly defined problem and limited potential for wider problem statement or study area;
  - Few or minor competing interests;
  - Solution(s) can be reasonably anticipated; and
  - Limited time and effort expected for completion.

Twice yearly, newly identified localized studies are added to an existing list of localized studies based on the prioritization worksheet presented in **Exhibit 2-3**. The top ranked studies (number undefined) are to be investigated over the following six months. Studies of selected projects that are not undertaken within the six-month period will carry over, even if newer studies score higher on the next ranking.

Exhibit 2-3: City of Ottawa Localized Study Prioritization Worksheet

Indicator	Point Score / Maximum Score	Local Roads	Collector Roads	Major Collector Roads
Inappropriate driver behaviour	/10	Up to 10 points if there is a history of complaints that can be verified through enforcement efforts		
Generators of vulnerable street users	/10	5 points per generator of vulnerable street users (schools, parks and community centres) on or in close proximity to street		
Pedestrian facilities	/10 (5 for local)	5 points if no sidewalk exists	10 points if no sidewalk exists; 5 points if one sidewalk exists	
Abutting land use	/10	Up to 10 points based percentage of street frontage that is primarily residential or pedestrian-oriented retail (e.g. "main street")		
15% of vehicles traveling at or over 50 km/h or speed limit	/15	1 point for every km/h over 50 km/h (or over posted speed limit if it is greater than 50 km/h)		
5% of vehicles traveling at or over 60 km/h (or if speed limit is more than 50 km/h, 15% travelling 10 km/h or more the speed limit)	/15	1 point for every km/h over 60 km/h (or 1 point for every km/h greater than 10 km/h over the posted speed limit if it is greater than 50 km/h)		
Motorized traffic volumes	/15	1 point for every 100 vehicles per day over 1000 or 1 point for every 10 vehicles per hour over 120 (in the busiest hour)	1 point for every 250 vehicles per day over 2500 or 1 point for every 25 vehicles per hour over 300 (in the busiest hour)	1 point for every 350 vehicles per day over 5000 or 1 point for every 35 vehicles per hour over 600 (in the busiest hour)
Through traffic volumes	/15	1 point for every 2% in the proportion of through traffic over 20% (minimum 20 through vehicles per hour)		
Collisions	/30	Ratio of collision rate to average collision rate (for streets or intersections, whichever is greatest).		
			Less than 0.75	0 points
			0.75 to 1.25	5 points
			1.25 to 2.0	15 points
			2.0 to 3.0	25 points
			Greater than 3.0	30 points
		If a vulnerable street user is involved in a collision within the most recent three-year period, the maximum of 30 points are given.		

Exhibit 3-5 Sample Prioritization Worksheet - Localized Studies . City of Ottawa. March 24, 2008. <http://www.ottawa.ca/residents/onthemove/driving/traffic/atm/exhibits/ex_3_5_en.html>

- Comprehensive Studies:
  - Affect several streets or entire neighbourhood;
  - May include arterials;
  - Many concerns that may be poorly defined;
  - Many or severe competing interests;

- Solutions are not readily apparent; and
- Significant expected time and effort.

Comprehensive studies are ranked using a similar prioritization process, as described in **Exhibit 2-4**. All comprehensive studies up for evaluation are ranked against each other on an indicator-by-indicator basis. The study with the most severe concern receives the full score for a particular indicator. The highest-ranking studies are then selected for implementation, based on available funding and resources required for completion within five years.

Exhibit 2-4: City of Ottawa Comprehensive Study Prioritization Worksheet

Indicator	Point Score (Relative to Other Projects)	
	Local or Collector	Arterial
Inappropriate driver behaviour	/10	/15
Generators of vulnerable street users	/10	/15
Pedestrian facilities	/10 (5 for locals)	/15
Abutting land use	/10	/10
15% of vehicles traveling at or over 50 km/h or speed limit	/15	/20
5% of vehicles traveling at or over 60 km/h (or if speed limit is more than 50 km/h, 15% travelling 10 km/h or more the speed limit)	/15	/20
Motorized traffic volumes	/15	N/A
Through traffic volumes	/15	N/A
Collisions	/30	/40

Exhibit 3-6 Sample Prioritization Worksheet - Comprehensive Studies. City of Ottawa. March 24, 2008. <http://www.ottawa.ca/residents/onthemove/driving/traffic/atm/exhibits/ex_3_6_en.html>

2.1.3 HAMILTON

The City of Hamilton approved a new comprehensive traffic calming and traffic management policy in late 2007. It supersedes a speed hump policy adopted in 2000. The Hamilton policy states that alternative strategies should always be pursued before a decision is made to install traffic calming devices, including:

- "Reviewing, establishing and/or revising and enforcing general Highway Traffic Act regulations and municipal by-laws pertaining to speed limits and other traffic control management items;
- Educating residents and neighbourhood groups so that they can better understand causes of traffic problems, potential solutions to these problems, and the advantages and disadvantages of implementing different solutions; and
- Installing any applicable regulatory, warning, or guide message signs or other traffic control devices which comply with approved standards."

The policy goes on to state, "Traffic calming or traffic management measures will not be supported on streets that serve as primary EMS response routes or HSR routes. This is because emergency response time increases and, depending on the measures used, patients in ambulances and passengers riding on buses, particularly standing passengers, may be jostled or thrown about."

Hamilton makes a distinction between traffic calming and traffic management. Its policy states that traffic calming is intended to reduce vehicle speeds, typically through horizontal and vertical deflection. Traffic management is defined as techniques such as signing, diversion and closures designed to reduce vehicle volumes.

Hamilton has a two-stage process of 'prerequisites' and 'technical criteria' for the assessment of requests for traffic calming and management. Prerequisites consist of:

1. An informal survey/poll conducted by the Ward Councillor or a petition indicating a reasonable level of support from the affected residents;

2. The subject roadway must function as a local or minor collector roadway;

3. The speed limit on the subject roadway must be at least 50 km/h;

4. The subject roadway must not be a primary emergency response route or designated HSR bus route; and

5. The roadway gradient must not exceed 5%.

In order for a Hamilton street to qualify for *traffic calming*, it must then meet all of the following technical criteria:

1. The minimum 24 hour volume on the subject street must be at least 750 vehicles per day for a local road and between 2,500 – 5,000 vehicles per day for a minor collector roadway. In cases where 'cut-through' traffic is greater than 30%, no minimum volume threshold is required;

2. The 85th percentile speed must be at least 8 km/h above the posted speed limit. In cases where the 85th percentile speed is at least 15 km/h above the posted speed, no minimum volume threshold is required;

3. The minimum block length must be at least 200 m;

4. There must be a sidewalk on at least one side of the road; and

5. A minimum support rate of 70% of all directly affected residences and 50% of indirectly affected residences must be achieved. The 'affected' areas are determined by staff in consultation with the Ward Councillor(s).

In order for a Hamilton street to qualify for *traffic management*, it must meet all of the following technical criteria:

1. The minimum 24 hour volume on the subject street must be at least 500 vehicles per day for a local road, and the road should be act primarily as a local street or minor collector;

2. Any prior attempts to improve traffic flow on the arterial/collector street system were undertaken without success;

3. The 'cut-through' traffic is greater than 50% of the total volume; and

4. A minimum support rate of 70% of all directly affected residences and 50% of indirectly affected residences must be achieved.

Following this two-step process, sites qualifying for traffic calming or management are scored and ranked on the basis of four warrants:

1. Speed;
2. Volume;
3. Pedestrians/Cyclists; and
4. Collisions.

2.1.4 WINDSOR

The City of Windsor's traffic calming policy (September 2005) is one of the few policies reviewed for this project that differentiates policy in existing neighbourhoods from that of new neighbourhoods. The policy states that traffic calming should be constructed in all new neighbourhoods in accordance with the Official Plan road classification for the area. Selected policy statements for new developments include:

- Roundabouts or traffic circles at intersections between local roads;
- Curb extensions and sidewalk treatments at intersections of local roads with collectors;
- Chicanes are required on straight sections of roadway greater than 300m in length;
- Pedestrian generators require lane narrowings and pavement markings; and
- Extensive use of median islands, especially to discourage cut-through traffic.

The procedure for traffic calming on existing roads is more extensive in Windsor than in many other municipalities. Like many others, it begins with a resident request. The city then performs a detailed warrant study; however, this warrant study goes beyond the requested street to include other streets that may form the study area for a more comprehensive traffic calming project. Factors in determining the study area include school catchment areas, natural landforms and railways. If warrants are met, the City then requests the resident making the complaint to go door to door to with a petition that people must sign to initiate a further development of the traffic calming plan.

Windsor uses an extensive warrant process, considering the following factors, with a maximum score of 90:

- Excessive Speed – to a maximum of 20 points;
- Excessive Volume – to a maximum of 20 points;
- Bicycle Route – to a maximum of 10 points;
- Collisions – to a maximum of 15 points;
- Pedestrian Generators – to a maximum of 15 points; and
- Total Percentage Of Residential Frontage – to a maximum of 10 points.

Where the policy differentiates between collector and local roadways—and also from the policies of other jurisdictions—is how it then assigns the total score to appropriate traffic calming measures. **Exhibit 2-5** and **Exhibit 2-6** illustrate how the scores relate to the type of traffic calming that can be implemented, for local and collector roads, respectively, as well as the City's assessment of the impacts on speed, volumes, conflicts and the environment. For any project, traffic calming measures of a lower level can also be implemented.

Exhibit 2-5: City of Windsor Appropriate Traffic Calming Measures For Local Roads

Measure	Speed Reduction	Volume Reduction	Conflict Reduction	Environment
Level 1 Calming – Score 21<36 - Signing				
Maximum Speed	Minor	Nil	Nil	Nil
Right or Left Turn Prohibited	Nil	Minor	Minor	Minor
Through Traffic Prohibited	Nil	Minor	Minor	Minor
Passive signage (i.e.: Traffic Calmed Neighbourhood)	Nil	Nil	Nil	Minor
Level 2 Calming – Score 36<56 – Horizontal Deflection				
Chicane - Two Lane	Minor	Nil	Minor	Minor
Curb Radius Reduction	Minor	Nil	Nil	Minor
On Street Parking	Minor	Nil	Nil	Minor
Lane Narrowing	Minor	Nil	Nil	Minor
Raised Median Island	Minor	Nil	Minor	Nil
Level 3 Calming – Score 56<76 – Horizontal Deflection				
Chicane - One Lane	Substantial	Substantial	Substantial	Minor
Curb Extension	Minor	Nil	Nil	Substantial
Traffic Circle	Substantial	Minor	Substantial	Substantial
Level 3 Calming – Score 56<76 – Diversion				
Intersection Channelization	Nil	Minor	Minor	Minor
Raised Median Through Intersection	Nil	Substantial	Minor	Minor
Right in / Right out Island	Nil	Substantial	Minor	Minor
Level 4 Calming – Score 76 < Max - Vertical Deflection				
Raised Crosswalk	Substantial	Nil	Minor	Minor
Raised Intersection	Minor	Nil	Minor	Minor
Sidewalk Extension	Minor	Nil	Minor	Nil
Speed Hump	Substantial	Minor	Substantial	Minor
Textured Crosswalk	Nil	Nil	Minor	Minor
Level 4 Calming – Score 76 < Max - Diversion				
Directional Closure	Nil	Substantial	Minor	Minor
Diverter	Nil	Substantial	Minor	Minor
Full Closure	Nil	Substantial	Substantial	Minor

Traffic Calming For Residential Areas Policy Paper. City of Windsor. September 2005.

If the warrant study finds that traffic calming measures are applicable, a petition is circulated among the affected residents. Support from 66% of all affected residences is required for the project to continue. Windsor's policy dates to a time when an EA was required for traffic calming implementation. The Class EA process was followed if the required level of support was achieved. It is not known how the policy will change now that an EA is no longer required.

Exhibit 2-6: City of Windsor Appropriate Traffic Calming Measures For Collector Roads

Measure	Speed Reduction	Volume Reduction	Conflict Reduction	Environment
Level 1 Calming – Score 31<46 - Signing				
Maximum Speed	Minor	Nil	Nil	Nil
Right or Left Turn Prohibited	Nil	Minor	Minor	Minor
Through Traffic Prohibited	Nil	Minor	Minor	Minor
Passive signage (i.e.: Traffic Calmed Neighbourhood)	Nil	Nil	Nil	Minor
Level 2 Calming – Score 46<76 – Horizontal Deflection				
Chicane - Two Lane	Minor	Nil	Minor	Minor
Curb Radius Reduction	Minor	Nil	Nil	Minor
On Street Parking	Minor	Nil	Nil	Minor
Lane Narrowing	Minor	Nil	Nil	Minor
Raised Median Island	Minor	Nil	Minor	Nil
Level 3 Calming – Score 76 < Max - Horizontal Deflection				
Curb Extension	Minor	Nil	Nil	Substantial
Level 3 Calming – Score 76 < Max - Diversion				
Intersection Channelization	Nil	Minor	Minor	Minor
Raised Median Through Intersection	Nil	Substantial	Minor	Minor
Right In / Right Out Island	Nil	Substantial	Minor	Minor

Traffic Calming For Residential Areas Policy Paper. City of Windsor. September 2005.

Recent conversations with City of Windsor staff revealed that the warrants process is generally working well. One specific challenge is that streets that already have a 40 km/h speed limit meet the warrants more readily than streets posted at 50 km/hr, since the excessive speeding component of the warrant compares observed speeds to posted speeds. This places streets that already have a 40 km/h speed limit at an advantage, even though the severity of traffic problems on a street posted at 50 km/h may be greater. Another challenge in Windsor is that people are generally resistant to traffic calming as their opinions are based on a few non-aesthetically pleasing examples from the early days of traffic calming. This resistance, and the fact that the petition portion of the warrants process requires someone to go door to door, makes it difficult to gain neighbourhood acceptance. The City is currently looking into using the 311 system to make the petition process easier.

2.1.5 PICKERING

The City of Pickering implemented its traffic calming policy in January 2003. The policy limits physical traffic calming measures to local, collector and Type C arterial roadways in the city. Traffic calming requests are addressed on a first-come, first-served basis. The Safer Streets Traffic Calming Review Committee must approve all proposed sites before recommendation to Council. This committee includes representatives from each of the following areas or city departments: fire, police, ambulance, transit, Planning & Development, Roads, and Traffic, and one resident appointed from City Wards 1 – 3 each. The committee has the ability to deny requests based on factors such as emergency vehicle response times, maintenance or transit operations.

Those requests that are approved are sent to the city Traffic Section for further study, including traffic speed and volume. The site is compared against a checklist as shown in **Exhibit 2-7**. In order for the project to proceed further, 70% support from affected residents is required.

Exhibit 2-7: City of Pickering Traffic Calming Review Checklist

City of PICKERING

Traffic Calming Review Checklist

DATE: _____

STREET: _____

MINIMUM CRITERIA

Facility Type	☐ Local	☐ Collector	☐ Type 'C' Arterial
Length of Facility	☐ Greater than 300 metres		
Number of Lanes	☐ Maximum of 2		
Local Road			
85th Percentile Speed	_____ km/h	☐ Exceeds 55 km/h	
AND/OR			
Infiltrating Traffic	_____ v/d of	_____ v/d	☐ Exceeds 30%
Collector Road/Type 'C' Arterial			
85th Percentile Speed	_____ km/h	☐ Exceeds 57 km/h	
AND/OR			
Infiltrating Traffic	_____ v/d of	_____ v/d	☐ Exceeds 30%

Note: The Traffic Calming request will be denied if any of the above criteria is not satisfied.

SECONDARY CRITERIA				POINTS
Transit Route	☐ Yes (0 Points)	☐ No (1 Point)		_____
Emergency Route	☐ Yes (0)	☐ No (1)		_____
Collision Experience	☐ Less than 3/year (0)	☐ More than 3/year (1)		_____
Pedestrian Generators	☐ Yes (5)	☐ No (0)		_____
Residential frontage	☐ < 60% (0)	☐ > 60% (1) + (1)/10%		_____
Service Function	☐ Traffic (0)	☐ Land Use (1)	☐ Combination (.5)	_____
Traffic Volumes	_____ v/d	☐ > Capacity (1)	☐ < Capacity (0)	_____
Roadway Grade	☐ < 5% (1)	☐ < 10% (.5)	☐ > 10% (0)	_____
Posted Speed Limit	☐ 40 km/h (0)	☐ 50 km/h (0)	☐ 60 km/h (0)	_____

Point Assessment — Total Points _____

Low Priority 0-5 Medium Priority 6-10 High Priority 11+

Note: Point system is not a warrant but rather a mechanism for reporting and discussion.

Traffic Calming Request Status

☐ Approved for further review ☐ Request Denied

Safer Streets Traffic Management Strategy Traffic Calming Policy. City of Pickering. January 2003.

2.1.6 MARKHAM

Traffic calming in the Town of Markham is one component of the Markham Safe Streets Task Force (MSSTF). The goal of the MSSTF is to change driver behaviour through education, enforcement and engineering. Traffic calming falls under the engineering category.

Markham has a history of installing speed humps as their primary traffic calming measure on existing roadways. Before and after studies indicate an average speed reduction of 10 km/h. The MSSTF recommends that speed humps continue to be installed as part of the overall Town strategy. Measures such as horizontal deflection, short block lengths and connector roads are encouraged for new developments.

However, the Town has realized that physical traffic calming measures on their own are not a suitable solution to reducing speeds, aggressive driving and other traffic-related problems in on its roads. In addition, some measures, particularly speed humps, serve to hinder transit and emergency services operations, as well as the movement of goods and people through the town. As a result, the MSSTF has approved the following criteria for considering physical traffic calming measures:

- **Major 4-Lane Collector Roads –** These roads are geared towards the enforcement and education components of the MSSTF, and therefore no physical traffic calming measures are to be installed except for heritage districts, e.g. Unionville;

- **Industrial/Commercial Park Roads –** As above. Enforcement and education only;

- **Priority Routes (Emergency Services and Public Transit) –** Average speeds (not 85th percentile) must be greater than 55km/h to qualify for physical traffic calming. Otherwise, these roads will also be the target of education and enforcement campaigns; and

- **All Other Roads –** Average speeds must be greater than 50km/h to qualify for physical measures, **but only after the implementation of enforcement and education initiatives**.

An appendix attached to the MSSTF outlines a method of technical evaluation of neighbourhood traffic problems and the selection of appropriate corrective measures. The contents of the appendix are taken from the Markham Transportation Committee *Guidelines for Neighbourhood Traffic Improvement Projects* (September 22, 1998) and are modelled on ranking and scoring systems developed by ITE and the City of Seattle. As with many other municipalities, the model assigns points to the collision history, traffic volumes and traffic speeds of the identified roadway. The MSSTF does not describe how particular measures are chosen from a street's total score, but it does indicate that solutions have come out of various public meetings that require traffic calming and traffic management to be implemented on a broader scale, rather than just a particular street or block.

The end result is a traffic calming process as follows:

- Resident(s) request traffic calming on a particular street or neighbourhood;

- Town of Markham Transportation Safety Committee (TSC) conducts a traffic operational study;

- The road is classified (major 4-lane collector, industrial/commercial, priority route, other);

- The MSSTF ranking system is used to prioritize the request;
- TSC and Council approve or deny the request; and
- The Safe Streets strategy (education and enforcement first) is followed if the request is approved.

Finally, if the request reaches a point where a physical traffic calming plan is developed and presented at a public meeting, 60% of affected property owners—defined as having frontage on the "defined catchment area"—must approve the plan for it to be implemented.

2.1.7 VAUGHAN

The City of Vaughan implements traffic calming through two primary mechanisms, namely, the development approvals process and the Neighbourhood Traffic Committees. In the former case, the City stipulates the preparation of a Traffic Management Plan as part of residential subdivision approval. In the latter case, Neighbourhood Traffic Committees are formed through Council direction and members of the Committee work with the City's Engineering department to prepare a traffic calming plan to address volume, speeding and safety concerns.

The City has developed warrants for speed humps, raised intersections, curb extensions, road narrowing and chicanes, which are the primary types of installations used in their neighbourhoods. The warrant process used in Vaughan is not as complex as in many other jurisdictions, as shown in **Exhibit 2-8**.

Exhibit 2-8: City of Vaughan, Where Traffic Calming Measures are Permitted

Traffic Calming Measure	Through Traffic Committee Process (Existing Areas)	Through Traffic Management Plan (New Developments)
Speed Hump	Subject to Warrant 1	No
Raised Crosswalk	Subject to Warrant 1	With Pedestrian Signal Only on Primary Roads
Raised Intersection	Where Possible	Yes
Roundabout	Yes	Yes
Median	Subject to Warrant 2	Yes
Curb Extension/Road Narrowing	Subject to Warrant 2	Yes
Chicane	Subject to Warrant 2	Yes
Contrasting Materials	Yes	Yes
Pavement Markings	Yes	Yes
Warning Signage	Yes	Yes

Warrant 1 – Speed Humps and Raised Crosswalks

Speed humps and raised crosswalks can be considered in existing residential areas only where the following three warrants are met:

- The street is not a primary emergency response route. The determination of whether a street is a primary emergency response route shall be made in consultation with the Engineering and Fire Departments.
- The speed limit is 50 km/h or less.
- The average speed on the street is measured to be 10 km/h greater than the speed limit.

Warrant 2 – Medians, Curb Extensions/Road Narrowings and Chicanes

Medians, curb extensions/road narrowings and chicanes shall be considered in existing areas only where the following two warrants are met:

- The speed limit is 50 km/h or less.
- The average speed on the street is measured to be 10 km/h greater than the speed limit.

Primary Roads are roads in new developments having a pavement width of 11.5 metres. This provides one travel lane in each direction, and space for on-street parking.

Traffic Calming. City of Vaughan. 2007. April 1, 2008.
<http://www.city.vaughan.on.ca/vaughan/departments/traffic_transportation/traffic_3.cfm>

Vaughan Council approved an update to its traffic calming policy in June 2007. The policy change was a result of Vaughan Fire and Rescue opposition to vertical traffic calming devices, as well as York Region Transit policy whereby the agency opposes vertical measures and reserves the right to remove transit services from any streets with such measures. The Vaughan Council resolution states:

> "All vertical Traffic Calming Measures currently utilized in the City of Vaughan, such as speed humps, raised crosswalks and the like, be discontinued on feeder, collector and arterial roadways and further, their implementation be subject exclusively to the 'Warrants For the Use of Traffic Calming Measures' document."

2.1.8 OAKVILLE

The Town of Oakville approved its traffic calming policy in 2003. That year, city staff surveyed 130 locations using the warrant process described below and found that 78 locations qualified for some sort of remedial traffic calming implementation.

Like many other jurisdictions, the Oakville traffic calming policy includes initial warrants and a prioritization process. The warrants and methodology were developed via a best practices review and public workshop stakeholder input. Oakville uses two speed warrants, as shown in **Exhibit 2-9**.

Exhibit 2-9: Town of Oakville Speed Warrant

Number of Possible Points	40 km/h Posted Speed**	Number of Possible Points	50 and 60 km/h Posted Speeds
0 to 100	85th speeds (10 points for every km/h 10 km/h over posted speed	0 to 100	85th speeds (10 points for every km/h 11-12 km/h over posted speed
0 to 100	High End Speeds (1 point for every high end speeder)	0 to 100	High End Speeds (1 point for every high end speeder)

Town of Oakville Traffic Calming Policy for Retrofit Situations Final Report. iTRANS Consulting, Inc. May 2003.

High end speeders are defined as traffic exceeding the posted speed limit by 15, 17 or 20km/h, for a posted speed of 40, 50,or 60 km/h, respectively. For roads with less than 500 vehicles per day, a minimum of 25 vehicles must satisfy this criterion.

Roadways are then ranked within three categories, in order of most tolerance for speeding to least based on stakeholder input: arterials, local and collector roads, and roads fronting onto elementary schools. The roads are then ranked based on the exposure criteria shown in **Exhibit 2-10**.

Exhibit 2-10: Town of Oakville Traffic Calming Exposure Methodology

Possible Number of Points	Exposure Criteria
0 to 15	5 points assigned for every pedestrian public facility (such as parks, playground, community centers, schools, seniors centre, religious institutions or other public institution) that generates a significant number of pedestrians on the street
0 to 15	1 point assigned for every residential driveway per 100 metres (on both side of the roadway)
0 to 10	5 points assigned for streets without sidewalks on one side 10 points assigned for streets without sidewalks
0 to 30	Average of 1 to 3 collisions per year over the past 3 years - 10 points for each average collision
70	**TOTAL POINTS**

Town of Oakville Traffic Calming Policy for Retrofit Situations Final Report. iTRANS Consulting, Inc. May 2003.

The product of the warrant score and the exposure score are used to determine the rankings of the studied roads. The Town of Oakville requires passive traffic calming measures to be implemented on any qualifying roadways before physical measures.

2.1.9 GUELPH

The City of Guelph implemented its traffic calming policy in 1998, and it was revised in November 2006. The policy outlines criteria for the implementation of traffic calming measures on local roads and two-lane collector roads, explicitly excluding arterials and multi-lane roadways so that they can perform their primary functions of moving traffic through and around the city.

The goals and objectives of the Guelph policy are primarily to improve public safety and general liveability of neighbourhoods by reducing vehicle speeds, discouraging 'cut-through' traffic and minimizing conflicts between all road users.

The Guelph policy outlines 12 principles that are to be followed for the selection and implementation of traffic calming measures. These principles are generally in line with the Environmental Assessment (EA) process that was previously required for traffic calming implementation. It is not known at this time if the Guelph policy will change now that the EA requirement has been lifted.

Traffic calming requests that come from residents are handled on a first-come, first-served basis. The next step is data collection on the requested street(s). The collected data is used to quantify the problem with a simple volume and traffic speed warrant, as shown in **Exhibit 2-11**.

Exhibit 2-11: City of Guelph Neighbourhood Traffic Review Criteria

Road Classification	Speed		Short-Cutting Traffic		Volume			
Local Roadway	IF	85th percentile ≥ 55 km/hr	OR	Infiltrating traffic exceeds 30%	AND	> 900 vehicles per day	➔	Initiate Traffic Review
Two-lane Collector Roadway	IF	85th percentile ≥ 60 km/hr	OR	Infiltrating traffic exceeds 30%	AND	> 2000 vehicles per day	➔	Initiate Traffic Review

Neighbourhood Traffic Management Policy. City of Guelph. July 1998 (revised January 24, 2006).

If the above criteria of the warrant are not satisfied, city staff notify the applicant, and the requested streets are excluded from further review for 24 months.

If the criteria are met, the applicant is required to distribute a petition to households on staff-identified streets. A 60% response rate is required for further action, with a minimum of 60% of the responses in support of the request. Following a process of public meetings, development of a possible plans and the selection of a preferred draft plan, another survey is distributed. A minimum of 60% of all surveys returned to the city must be in favour of the recommended plan for implementation to occur.

2.1.10 KINGSTON

The City of Kingston currently does not have an official traffic calming policy. To date, the city has completed at least one pilot project, the installation of speed humps and curb extensions on Hudson Drive.

This project arose from resident complaints and requests for traffic calming measures to be implemented on Hudson Drive as well as two other city streets. In 2003, Council asked the Engineering Division to prepare a report to discuss the effectiveness of traffic calming on these streets, and to develop a system that could be used to prioritize and rank the three roads. Kingston modified the City of Toronto traffic calming warrants for their own needs, and produced a ranking table. As the table was designed to rank competing sites, no minimum score was required for traffic calming implementation; however, the volume and speed warrants needed to meet the established minimum criteria.

An EA was conducted for this study as was required at the time. The city has monitored the measures since installation and has deemed them a success. In February 2008, Kingston issued an RFP for Consulting Services for Traffic Calming Measures. The project was awarded to TSH and is currently underway.

2.1.11 WATERLOO

The City of Waterloo implements traffic calming measures contingent upon meeting the warrant criteria presented in **Exhibit 2-12**. Requests for calming are assessed against these warrants with input from Waterloo Regional Police Service, Ambulance Services, Grand River Transit, Waterloo Fire Department, school boards, the Region of Waterloo and adjacent municipalities.

Exhibit 2-12: City of Waterloo Traffic Calming Criteria

Warrant	Criterion	Requirement
Warrant 1 Survey	1.1 Survey	The City will conduct a survey of the affected residents on the street to determine if general support for traffic calming exists. In order to proceed, a minimum response rate of 40% of the affected residents is required, 60% of which must support traffic calming measures. Warrants #2 and #3 will not be considered until Warrant #1 is satisfied.
Impacts to Adjacent Street		Should the Traffic section anticipate that the proposed traffic calming will have significant traffic impacts on adjacent streets, the review of the traffic calming proposal shall be modified to include the proposed street as well as the adjacent streets where traffic is expected to divert.

Warrant	Criterion	Requirement
Warrant 2 Safety Requirements (Both criteria must be fulfilled to satisfy this warrant)	2.1 Road Grade	Traffic calming measures must not be installed at or near locations where the road grade exceeds 8%.
	2.2 Emergency Response/ Service Delivery	On streets where traffic calming is proposed, impacts on Emergency services and operational services will be not significant.
Warrant 3 Technical Requirements (All 3 criteria must be fulfilled to satisfy this warrant)	3.1 Minimum Speed	On streets where traffic calming is proposed, the 85th percentile is greater than 10 km/hr over the speed limit.
	3.2 Minimum Traffic Volume	Local Roads – For streets where traffic calming is proposed, the traffic volume must be at least 900 vehicles per day (vpd). Physical traffic calming measures as indicated in Appendix 2 will not be constructed on collector or arterial roadways.
	3.3 Transit Service	On streets where traffic calming is proposed, impacts on Grand River Transit will not be significant.

Traffic Calming Policy. City of Waterloo.

If the above warrants are met, the City carries out a survey of affected residents. It must be met with 60% support for the project to continue. If the warrants are not met, the street is ineligible for traffic calming consideration for two years. As with Windsor and Guelph, the Class EA process was still required for traffic calming implementation at the time the policy was enacted. The recommended plan put forth through the EA process was subject to another round of resident approval. A 40% response rate was required, with a minimum 60% support from those who respond. It is unclear how the City of Waterloo will change this portion of their policy to reflect the removal of EA requirements.

2.1.12 AJAX

In late 2007, IBI Group developed a traffic calming warrant process and framework for the Town of Ajax. The Ajax process and framework builds upon the "Final Traffic Calming Report" endorsed by Ajax Council on June 23, 2005. That report listed several recommendations for traffic calming initiatives on roads under the Town's jurisdiction but did not outline a process for the evaluation and prioritization for any of the initiatives. In response, IBI Group created a comprehensive warrant that will guide Town staff from initial request through to implementation. The six-step process consists of:

1. Request for traffic calming;
2. Traffic calming screening process;
3. Evaluation scoring and ranking;
4. Selection of available traffic calming measures;
5. Project selection and Council study approval; and
6. Design, public support, final Council approval, implementation.

At the heart of the warrant is the two-stage process similar to that of other jurisdictions. In order for a site to qualify for traffic calming consideration, a site must exceed a minimum:

- Number of collisions during a three-year time frame; or
- Volume threshold and one or both of the following:
  - Speed threshold; and/or
  - Non-local traffic threshold.

Once a site qualifies for consideration, it is scored against the following 11 categories. A maximum score in each category will result in a score of 100 points:

- Collision History
- Traffic Speeds
- Non Local Traffic
- Traffic Volumes
- Pedestrian Generators
- Pedestrian Facilities
- Emergency Services and Routes
- Transit Services and Routes
- Truck Routes
- Block Length
- Adjacent Land Uses (residential)

The scores are then used to rank candidate sites against each other and determine priority locations.

While the process developed for Ajax is based on those of other jurisdictions, care was taken to ensure that the final warrant met the needs and goals of Ajax. To that end, Town staff selected the evaluation criteria used in the qualification and ranking stages based its own needs. The result is a comprehensive traffic calming warrant unique to Ajax.

2.2 Elsewhere in Canada

On a neighbourhood level, the traffic calming policies, practices and implementation processes of large cities are often very similar to those of suburban communities and smaller towns. The research supports this assertion, as evidenced by various smaller communities in Ontario adopting and adapting the traffic calming policies of Toronto or Seattle, for example. However, in order to focus the research effort for the rest of Canada, emphasis was placed primarily on the practices and policies of communities that may be similar to Sudbury in terms of population and/or setting.

British Columbia has the most traffic calming experience outside of Ontario, and perhaps throughout the entire country. As such, this section includes of current practices in three of its municipalities, as well as those of Calgary, a recognized leader in Canadian traffic calming.

2.2.1 CALGARY, ALBERTA

The City of Calgary 2002 traffic calming policy is a thorough and comprehensive document discussing the goals, objectives and principles of traffic calming. It describes in great detail a screening, evaluation and prioritization process similar to that of other jurisdictions, but goes further to discuss elements that other jurisdictions may not consider explicitly in their policies, such as community initiatives, appropriate measures for various types of roadways and technical design guidelines for physical measures.

Calgary relies less on quantitative analysis for its screening and prioritization, and more on community support and staff analysis to determine an appropriate response for a given issue. **Exhibit 2-13** lists the evaluation criteria used in Calgary. Each point is evaluated on a subjective basis, depending on relative severity and importance. The listed criteria applies both to localized and area-wide studies.

Exhibit 2-13: City of Calgary Evaluation Criteria – Traffic Calming Issues

Criteria	Measurement	Rating	
		Scale	Indicator
Speed	24-hour 85th percentile speeds in both directions (during daytime hours for school and playground zones)	0 to 20	20 represents area with highest recorded speed differentials and greatest number of streets with speeding
Volume	Percentage short-cutting traffic in peak 2-hour period, in peak direction, on most significant short-cutting route, and daily traffic volume	0 to 20	20 represents area with highest volume of short-cutting traffic and highest daily traffic volume relative to road classification
Collisions	Collision rate and severity of reported collisions in 3 years at most significant location (most recent data available)	0 to 20	20 represents area with highest number and severity of collisions
Safety	Sidewalks—proportion of neighbourhood streets with continuous sidewalks on at least one side	0 to 5	5 represents area with fewest sidewalks
	Pedestrian—number of schools and major pedestrian generators in area, and numbers of pedestrians	0 to 10	10 represents area with highest number of pedestrian generators and highest level of pedestrian use
	Cyclists—number of designated bicycle routes in area, and number of cyclists	0 to 5	5 represents area with highest number of bicycle routes and highest level of bicycle use
Community Support	Percentage of households supporting requested action	0 to 20	20 represents area with highest level of support

Traffic Calming Policy, The City of Calgary, December 10, 2002.

2.2.2 DELTA, BRITISH COLUMBIA

Delta is a district municipality in the British Columbia lower mainland, located midway between Vancouver and the Washington border. Its population is approximately 103,000. Its traffic calming policy, established in March 2003, applies only to its urban roads, and not rural or agricultural roads. Traffic calming studies can be initiated by staff, Council or by resident request. When initiated by residents, requests are evaluated based on the screening process shown in **Exhibit 2-14**.

Exhibit 2-14: Delta, British Columbia Preliminary Scoring for Local Roads

Criteria	Points	Basis for Point Assignment
Speed	0 to 25	85th percentile traffic speeds more than 5 km/h above the posted limit. (5 points for every km/h)
Volume	0 to 25	Average daily traffic volumes (1 point for every 100 vehicles)
Total Points Possible	50	

Neighbourhood Traffic Calming Policy and Procedures, The Corporation Of Delta, British Columbia, March 2003.

Any requests that do not score at least 25 points are removed from consideration. Council prioritizes the candidate projects for funding during their annual budget process. Surveys are sent to all households and businesses in the study area of candidate sites that score at least 25 points. Study areas are defined as the residents and businesses of a street with traffic speed problems, or the residents and businesses of a neighbourhood, if the problem is traffic infiltration. A 50 percent survey rate of return is required, and a majority of responses must be in favour of the project in order for it to advance to the budget consideration stage.

Further prioritization criteria include the following, but the quantification method is not explained:

- Safety performance;
- Traffic characteristics;
- Physical characteristics; and/or
- Environment.

2.2.3 KELOWNA, BRITISH COLUMBIA

The City of Kelowna's Neighbourhood Traffic Management Policy (June 2001; last reviewed April 2006) does not include a warrant process for traffic calming implementation, but it does describe the prioritization process. The first prioritization criterion is the resident request. Locations that do not receive requests for traffic calming will not be considered by the city. Secondary criteria include:

- Number of request locations. Note: refers to number of issues or locations within a neighbourhood, not the number of requests for calming;
- Number of reported collisions within each neighbourhood (excluding arterials);
- Sidewalks in pedestrian areas;
- Locations where road geometry is known to be poor;
- Pending road improvements that may address resident concerns; and
- Planned roadway rehabilitation that may offer an opportunity to implement traffic calming measures.

The secondary criteria are rated on a significance scale of 1 through 5.

Kelowna will only develop traffic calming plans on an area-wide, neighbourhood basis, even if the measures can be implemented at a single point. This ensures that selected measures are appropriate for the whole neighbourhood and that the implementation of calming in a particular

location does not simply shift the problem to adjacent streets. To address this, the City has developed boundaries for 50 neighbourhoods. These boundaries will serve as the study area for traffic calming requests. Where necessary, the City will merge neighbourhoods for a particular request.

2.2.4 SAANICH, BRITISH COLUMBIA

The District of Saanich is located just north of Victoria on Vancouver Island. Its population is approximately 110,000. Under its traffic calming policy (2000), resident requests for traffic calming are first evaluated against the criteria in **Exhibit 2-15**, with a minimum score of 40 required for traffic calming consideration. For area-wide requests or those consisting of more than one location, scoring is done for the location with the greatest problems, as perceived by the resident(s) submitting the request.

Localized requests are processed on a first-come, first-served basis; however, wide area requests are ranked and prioritized on the basis of **Exhibit 2-16**. The street with the worst traffic calming situation is used in the assessment.

Exhibit 2-15: Saanich, British Columbia Criteria for Determining Eligibility of Traffic Calming Applications

Criteria	Points	Basis for Point Assignment
Speed	0 to 50	85th percentile speed of traffic. (1 point will be allocated for every kph the 85 percentile speed is over stated speed limit, based on speed reader board information supplied by applicant)
Volume	0 to 50	Average daily traffic volumes (1 point assigned for every 100 vehicles, based on traffic count done whilst using speed reader board)
Education	10	Motorist education program used to no avail.
Enforcement	10	Enforcement program used to no avail.
Total Points Possible	**120**	

Manual on Policy and Procedures for Traffic Calming in Saanich, The District of Saanich, British Columbia, June 2000.

Exhibit 2-16: Saanich, British Columbia Ranking of Area Wide Traffic Calming Applications

Criteria	Points	Basis For Point Assignment
Speed	0 to 50	85 percentile speed of traffic. 5 points will be allocated for every kph the 85 percentile speed is over stated speed limit
Volume	0 to 50	Average daily traffic volumes (1 point assigned for every 100 vehicles
Vehicle Collisions	0 to 25	Average number of vehicle collisions over the last 3 years, based on police reports. Five points will be allocated for every collision in an average year.
Elementary Schools	0 to 10	5 points assigned for each school zone in the street
Pedestrian Generators	0 to 15	5 points assigned for each public facility (such as parks, community centres, and high schools) that generates a significant number of pedestrians on the street
Safe Route to School	0 to 5	5 points assigned for a safe route to school on the street
Bicycle Routes	0 to 5	5 points assigned if the street is a designated bicycle route
Transit Streets	0 to 5	5 points assigned if the street is a designated transit route

Criteria	Points	Basis For Point Assignment
Pedestrian Facilities	0 to 5	5 points assigned if there is no continuous sidewalk on at least one side of the street.
Total Possible Points	170	

Manual on Policy and Procedures for Traffic Calming in Saanich, The District of Saanich, British Columbia, June 2000.

2.3 United States

A 1998 survey by the University of California at Berkeley cited approximately 350 U.S. cities and counties that engaged in some form of engineered or non-engineering traffic calming measures. In a similar survey of 153 city and county jurisdictions in the 13 western US states, the ITE determined that 110 reported the use of one or more engineering methods for traffic calming. Given the age of these surveys, it can be expected that the number of jurisdictions who have implemented traffic calming will have increased significantly. With this wealth of experience and interest it would be expected that a national standard or guideline document would provide directions for the implementation of traffic calming. What appears to be the case instead is myriad traffic calming policies, guidelines, designs, and programs based on individual jurisdictional practices.

The most comprehensive US document to date addressing traffic calming is still *Traffic Calming: State of the Practice* published by ITE and FHWA in August 1999. Twenty-five traffic calming programs from across the US were featured in the document, which covers all aspects of arterial and neighbourhood traffic calming.

Some of the more ambitious programs/initiative are outlined below.

2.3.1 SARASOTA, FLORIDA

The City of Sarasota is located on the Gulf Coast of Florida and has an approximate population of 55,000. Traffic calming requests in Sarasota are initiated by residents through their Neighborhood Traffic Calming Task Force, if one exists. If the neighbourhood does not have a task force or other Neighborhood Association, requests can be sent directly to the City Engineering Department. Requests are addressed in the order received, and if it is found that traffic calming is unwarranted, the streets are ineligible for consideration for a period of five years, unless the residents pay for the collection of new traffic counts. In addition, residents may directly fund unwarranted traffic calming devices (with the exception of speed tables), provided the City Engineer deems the device feasible.

Sarasota uses a warrant approach that differentiates between major collectors, minor collectors and local streets. The warrants and associated minimum criteria are described for collectors in **Exhibit 2-17**. The Sarasota *Traffic Calming Manual* does not indicate how many warrants need to be met in order to qualify for traffic calming.

Exhibit 2-17: Sarasota, Florida Traffic Calming Warrants for Collectors

Warrant	Major Collector	Minor Collector
Warrant 1 - Minimum Vehicular Volume	> 4,000	> 8,000
Warrant 2 - Calculated Cut-Thru Traffic	40%	50%
Warrant 3 - 85th Percentile Speed	10 mph over posted speed	10 mph over posted speed
Warrant 4 - Pedestrian Volume	50 per hour	100 per hour
Warrant 5 - Crash Data	6	6

Traffic Calming Manual, City of Sarasota, Florida, September 2003.

Most requests for traffic calming in Sarasota are for local streets. The warrants for local streets are tailored to preserve the function of these streets—to get residents to and from their homes—and are described in **Exhibit 2-18**.

Exhibit 2-18: Sarasota, Florida Traffic Calming Warrants for Local Streets

Warrant	Criteria	Points
85th Percentile Speed Residential roadways have a speed limit of 25 mph unless posted otherwise.	1-5 mph (above posted speed)	2
	6-10 mph	3
	≥ 11 mph	5
Percentage of Cut-Through Traffic Cut-through traffic is determined using the following calculation: Volume minus the number of resident trips (# of homes on block X 10) divided by the volume.	25% - 49%	1
	≥ 50%	2
Vehicle Volume Per Day (AADT) Average annual daily traffic counts adjusted seasonally.	1000 - 1499	1
	≥ 1500	2
One Way Streets Percentage of vehicles traveling the wrong way based on daily traffic volume	≥ 10%	2
Pedestrian Volume Based on 25 > students per peak hour. Pedestrian volumes for parks are counted on an individual basis.	Elementary & Middle Schools within a 1/4 mile radius	2
Crash Data per Year Collected from the City of Sarasota Police Department	1 - 3	1
	≥ 4	2
***Minimum of six (6) Points**		

Traffic Calming Manual, City of Sarasota, Florida, September 2003.

2.3.2 TALLAHASSEE, FLORIDA

The City of Tallahassee is the capital of Florida. It has a population of approximately 160,000 and is located in the Florida Panhandle. Tallahassee has a particularly extensive traffic calming warrant process, the result of over 15 years of traffic calming planning and 11 years of traffic calming installations. The most recent revisions to their policy were made in June 2001. In order to initiate the traffic calming process, a petition must be signed by 75% of 'adjacent' residents. The term 'adjacent' is undefined in the policy, although it appears to be the residents of the block or street that is the subject of the petition. Tallahassee's traffic calming website describes a variety of reasons why a study may still not be initiated even with 75% support. Some of these reasons include:

- Roadway classification is not appropriate for traffic calming;
- The requested street may be part of an area-wide plan or the increase in volumes may be due to construction elsewhere in the city; and
- Increased enforcement may be a better solution.

While not exactly a warrant process, the Tallahassee Residential Traffic Calming Program Priority Ranking incorporates much of the same data that other jurisdictions use in their warrants, as shown in **Exhibit 2-19**. Once the score of a petitioned site is calculated up to a maximum of 105 points, it moves into its place on the Residential Area Traffic Calming Priority Listing. Higher-priority requests on this list are addressed first.

Exhibit 2-19: Tallahassee, Florida Residential Traffic Calming Program Priority Ranking

Traffic Volumes

Volumes (vehicles/day)	Points
0-500	0
501-1500	5
1501-2500	10
> 2500	20

Speeds

Points = 85th percentile speed (mph) - 25 mph.
Not to exceed 20 points

Accidents

Number of mid-block accidents over a 3-year period, divided by 3, divided by the roadway length in miles. Accidents at intersections are not counted.

Average annual accident rate/mile	Points
0.0-0.9	0
1.0-1.9	5
2.0-2.9	10
3.0-3.9	15
> 3.9	20

Schools

Each school within 1 mile of impact area is 5 points. Not to exceed 10 points. If there are more than two schools within 1 mile of impact area, the extras are added to "Other pedestrian generators".

Other Pedestrian Generators

5 points per pedestrian generator, including extra schools, parks, and playgrounds. Not to exceed 10 points.

Sidewalks

No sidewalk: 10 points.
Sidewalk on one or both sides: 0 points.

Density

Calculated by dividing the number of residential units fronting the roadway by the length of the roadway in miles.

Residential units/mile	Points
0-33	0
34-67	5
68-99	10
> 99	15

Residential Traffic Calming Program Priority Ranking. City of Tallahassee, Florida. March 24, 2008. <http://www.talgov.com/pubworks/traffic_calm_priority.cfm>

Following City field review, conceptual plan development and a public meeting, another round of resident voting is conducted. Again, 75% support of all residents on the roadway is required for final design and construction.

Tallahassee previously published a list of streets on its Traffic Calming Priority List. The most recent data year was 2002, and at the time, there were 76 streets on the list. Points for these streets ranged from a high of 78 to a low of 20. The median score was 50. The City's website now states that all traffic calming projects—with the exception of one project currently on hold—were completed.

2.3.3 AUSTIN, TEXAS

The City of Austin has developed a process to identify and address problems related to speeding motorists, excessive volume and overall road user safety in residential areas. The City initiated a speed hump program in 1994 and has had over 1,100 requests for speed humps or traffic calming in the past ten years. To address this demand, the City has established selection criteria for the prioritization of traffic calming studies as a function of the quantity of complaints, speed data and collision data. The City uses speed humps, speed cushions, traffic circles, chicane, semi-diverters and curb extensions as the primary means of traffic calming in their neighbourhoods.

2.3.4 PORTLAND, OREGON

The City of Portland has an extensive traffic management policy including traffic calming applications. The City takes a proactive approach to traffic calming and maintains a citywide list of neighbourhoods that could benefit from traffic calming devices. Their ranking system is based on a primary (short-listing) screening process based on traffic speed and volume, followed by a detailed ranking system based factors including: speed, volume, pedestrian generators, routes and facilities, elementary schools and, bicycle and transit routes. The City maintains a website which provides detailed information on the traffic calming process and the advantages/disadvantages of the various devices considered for Portland's streets.

At this time, the program has been suspended due to a lack of funding; however, residents can directly fund traffic calming devices for their neighbourhoods.

2.3.5 ORLANDO, FLORIDA

The City of Orlando has established a neighbourhood traffic management process, which begins with the formation of a traffic committee of residents from the streets or area of concern. All forms of traffic management including education, enforcement and engineering are considered in developing an action plan to address neighbourhood concerns. Once a traffic management plan is completed, it is presented to the neighbourhood and subsequently supported through a petition, requiring 65% support of the landowners within the designated affected area. The City employs a full range of traffic calming devices with speed humps, median islands and mini-roundabouts as the primary devices. Policies guidelines have been established relating to:

- Maintaining local and emergency services access;
- Considering the impacts of a plan and "moving the problem" to adjacent neighbourhoods and streets;
- Acceptable types of traffic calming measures for City roadways; and
- Reviewing arterial road improvements prior to undertaking neighbourhood traffic management projects.

2.3.6 TULSA, OKLAHOMA

Tulsa's traffic calming policy (June 2003) includes a warrant process that is somewhat unique when compared to the other policies reviewed in this document. When the two primary warrants cannot be met, it allows for a percentage of the required volume warrant, plus two additional criteria, as shown in **Exhibit 2-20**. It also provides a mechanism where excess speed can be 'traded' for additional volume as a further means of satisfying the warrant criteria.

Exhibit 2-20: Tulsa, Oklahoma General Traffic Calming Warranting Criteria

The following must be met to qualify a street segment for traffic calming:

Warrant No. 1
- and -
Warrant No. 2

- or -

Warrant No. 1
- and -
0.80 x Warrant No. 2
- and -
Warrant No. 3
- or -
Warrant No. 4

Warrant	**Street Classification[1]**	
	Residential Collector	**Local Residential Street**
1. 85th-percentile speed	≥ 8 mph over posted speed	
2. Minimum 24-hour traffic volume[2]	≥ 1,800 vpd	≥ 900 vpd
3. Total crashes[3] (Two most recent consecutive years)	5	
4. Peak hour volume[4]	phv ≥ 1.5 x 0.10 x vpd	

vpd = vehicles per day; phv = peak hour volume

[1] As determined by Public Works staff

[2] For every additional 1 mph speed over the 8 mph speed threshold, 100 vehicles per day can be added to the 24-hour traffic volume to help facilitate the warrant meeting requirements.

[3] Only those crashes correctable by the installation of traffic calming devices will be considered in the warrant considerations for the site-specific application

[4] As rule-of-thumb, peak hour volume for a segment is estimated at 10% of the 24-hour volume. If excessive non-local cut-through traffic is using the segment, this peak hour volume will be exaggerated. Hence, Warrant no. 4 is met when the actual peak hour volume is greater than or equal to 1.5 times this computed peak hour volume value.

Neighborhood Traffic Calming Manual, City of Tulsa, Oklahoma, July 1, 2003.

2.3.7 OTHER JURISDICTIONS

This section consists of the criteria for traffic calming implementation and ranking for additional selected municipalities in the United States.

Madison, Wisconsin

- Average Daily Traffic Volume;
- Speed;
- Crash Record (Police Reported);
- Elementary, Middle and High Schools;

- Other High Pedestrian Generating Areas;
- School Walk Route;
- Designated Bicycle Routes;
- Scheduled Road Reconstruction; and
- Time on Project List.

Colorado Springs, Colorado

- Neighbourhoods with an evident cut-through traffic problem;
- Areas with a large number of pedestrian collisions, bicycle collisions, and vehicle collisions (in that order);
- Projects where problems with vehicle speed and traffic volumes are severe;
- Problems in close proximity to schools, hospitals, or parks (in that order); and
- Areas with a large amount of pedestrian and bicycle traffic.

Boulder, Colorado

- Speed;
- Volume;
- Housing Density; and
- Bike/Pedestrian Activity.

Napa, California

- **Speeding** – 85th percentile speeds exceed the posted speed limit by more than six mph;
- **Traffic Volumes** – traffic volumes exceed 2,500 vehicles per day on a local street, or 5,000 vehicles per day on a residential collector;
- **Pedestrian Volumes** – pedestrian volumes at a particular crossing exceed 40 pedestrians during a one-hour period or 25 pedestrians per hour for a four-hour period and sidewalks or stop-controlled crossings are not provided; and
- **Safety** – three or more reported collisions per year that may be correctable through traffic calming measures over a three-year period at a specific location.

3. SUMMARY AND CONCLUSIONS

Exhibit 3-1 summarizes many of the major traffic calming criteria used by the jurisdictions reviewed in this report. It should be noted that the list is not comprehensive: some of the jurisdictions use screening criteria not on the list below, while other jurisdictions may in fact use some of the

unchecked criteria but do not make it clear either in their policies or their websites. The City of Kingston is not included in this table since the literature reviewed does not explicitly indicate their warrant criteria; instead, it indicates that the City of Toronto was used as a model.

Exhibit 3-1: Studied Jurisdictions vs. Major Traffic Calming Criteria

Jurisdiction	Criteria																
	Operating Speed	Traffic Volumes	Block Length	Transit Route	Collision History	Land Use	Facility Type	Emergency Route	Grade	Pedestrian and/or Bicycle Concerns	Sidewalks	Cut-Through Traffic	Pending or Planned Improvements	Other Programs	Schools	Residential Units/Frontage	Number of Requests / Complaints
Toronto	X	X	X	X	X			X	X	X	X						
Ottawa	X	X			X	X	X			X		X				X	
Hamilton	X	X	X	X	X	X	X	X	X	X			X		X		X
Windsor	X	X			X					X						X	
Pickering	X	X	X	X	X		X		X	X		X				X	
Markham	X	X			X		X										
Vaughan	X							X									
Oakville	X				X					X	X					X	
Guelph	X	X										X					
Waterloo	X	X		X				X	X								
Ajax	X	X	X	X	X	X	X	X	X	X	X	X			X	X	
Calgary	X	X			X		X			X	X	X					X
Delta	X	X			X												
Kelowna					X						X		X				X
Saanich	X	X		X	X					X				X	X		
Sarasota	X	X			X		X			X		X					
Tallahassee	X	X			X					X	X				X	X	
Austin	X				X												X
Portland	X	X		X						X					X		
Orlando	X	X			X			X									
Tulsa	X	X			X												
Madison	X	X			X					X			X		X		
Colorado Springs	X	X			X					X		X			X		
Boulder	X	X								X						X	
Napa	X	X			X					X							

It can be seen that while no standard traffic calming warrant exists, most jurisdictions offer variations on a theme. Traffic volumes, speeds and collision histories are the most commonly used criteria, each used by at least 67% of the studied jurisdictions. Pedestrian and/or bicycle concerns (not including sidewalks) are also used in over 60% of the jurisdictions. These predominant criteria

indicate a strong desire to ensure safety of neighbourhoods and local communities, as traffic calming measures are most often applied to local roadways.

The community-based impetus behind traffic calming measures is further illustrated in the number of jurisdictions that rate cut-through traffic, schools and residential frontage/density as important factors in their warrant processes.

There is also no standard application of traffic calming measures for local versus collector roads, or for local versus area-wide studies. While many jurisdictions do implement different warrant criteria based on facility or area type, no standard practice prevails.

Other points from the research include:

- Public involvement is universal, as all studied municipalities use the public consultation and support process;
- All jurisdictions with the exception of Kelowna take vehicle speeds and/or volumes into account;
- Collision history is the next highest-utilized factor, used in all but five jurisdictions;
- Pedestrian generators and facilities (sidewalks), and adjacent land uses, typically specified as residential or schools, are widespread in their application;
- No jurisdictions except Ajax explicitly consider whether a road is a truck route. This may be taken into consideration by the roadway type, e.g. limited traffic calming implementation on arterials and industrial collectors (Markham); and
- The number of jurisdictions that explicitly consider emergency and transit facilities is lower than expected, although many jurisdictions may consult with their EMS and transit agencies during the study process.

While not addressed explicitly in most traffic calming policies or warrants, it is understood that minimizing staff time and effort is a critical step in the process. The very nature of a traffic calming warrant, in addition to presenting an equitable procedure for the need and justification of traffic calming measures, is to minimize the level of effort necessary to reach a decision. The warrant process is designed for ease of application, as in many cases the traffic data required for the warrant process can be collected quickly and inexpensively, and much of the other information (e.g. adjacent land uses, roadway classification, collision history) is data that may already be on file.

An example that stands out as being potentially onerous towards staff effort is Windsor. The complexity of its warrant process means that more work may be required by staff to evaluate the warrants; however, this was not raised as a concern in discussions with Windsor staff.

4. NEXT STEPS

1. Review resident traffic complaints, traffic calming requests received by the City of Greater Sudbury and other traffic data to determine how they would correspond to the 'typical' warrant structure;
2. Develop on-line survey and consultation materials to identify what traffic calming warrant criteria is most important to the residents of Sudbury. The materials will be

used as a traffic calming primer for residents and to help build consensus and public buy-in to the warrant process;

3. Incorporate comments and feedback from the March 26, 2008 staff workshop with various departments and agencies within the City of Greater Sudbury. The feedback will ensure that the traffic calming warrant that is developed for this project fulfills their needs and requirements to the extent possible; and

4. Use all of the information collected to date to develop a traffic calming warrant, ranking and prioritization process that is appropriate for the City of Greater Sudbury.

5. LINKS TO MUNICIPAL TRAFFIC CALMING WEBSITES

The following municipal websites were consulted in preparing this document. Specific policy and other documents are directly referenced in the text above.

- **Toronto**—http://www.toronto.ca/transportation/traffic/traffic_calming.htm
- **Hamilton**— http://www.myhamilton.ca/NR/rdonlyres/2E7EB619-F5D7-40B5-93FA-4C8E17A8FD03/0/Dec03PW07150.pdf
- **Ottawa**—http://www.ottawa.ca/residents/onthemove/driving/traffic/atm/index_en.html
- **Windsor**—http://www.citywindsor.ca/001440.asp
- **Pickering**—http://cityofpickering.com/standard/services/traffic/calming.html
- **Markham**— http://www.markham.ca/Markham/Departments/Eng/Trnsp/TrafficCalming.htm
- **Vaughan**— http://www.city.vaughan.on.ca/vaughan/departments/traffic_transportation/traffic_index.cfm
- **Oakville**—http://www.oakville.ca/trafficcalming.htm
- **Guelph**—http://guelph.ca/living.cfm?itemid=46346&smocid=1809
- **Kingston**— http://www.cityofkingston.ca/residents/transportation/streets/trafficcalming/index.asp
- **Waterloo**—http://www.city.waterloo.on.ca/DesktopDefault.aspx?tabid=1097
- **Ajax**— http://www.townofajax.com/Page98.aspx
- **Calgary**— http://www.calgary.ca/portal/server.pt/gateway/PTARGS_0_0_104_0_0_35/http%3B/content.calgary.ca/CCA/City+Hall/Business+Units/Transportation+Infrastructure/Construction+Projects/Traffic+Calming/Traffic+Calming.htm
- **Delta**—http://www.corp.delta.bc.ca/EN/main/residents/272/907/traffic_calming.html
- **Kelowna**—http://www.city.kelowna.bc.ca/CM/Page376.aspx

- **Saanich**—http://www.saanich.ca/resident/roads/trafficcalm.html
- **Sarasota**—http://www.sarasotagov.com/InsideCityGovernment/Content/Engineering/Programs/TrafficCalming.html
- **Tallahassee**—http://www.talgov.com/pubworks/traffic_calming.cfm
- **Austin**—http://www.ci.austin.tx.us/trafficcalming
- **Portland**—http://www.portlandonline.com/transportation/index.cfm?c=40520
- **Orlando**—http://www.ci.orlando.fl.us/public_works/traffic/steps1.htm
- **Tulsa**—http://www.cityoftulsa.org/Community/Drive25/DriveEngineering.asp
- **Madison**—http://www.cityofmadison.com/trafficEngineering/programsTraffic.cfm
- **Colorado Springs**—http://www.springsgov.com/Page.asp?NavID=1689
- **Boulder**—http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=305&Itemid=1352
- **Napa**—http://www.cityofnapa.org/index.php?option=com_content&task=view&id=51&Itemid=280