CNCL-22-37 Attachment 1

Oshawa Neighbourhood Traffic Management Guide

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1. Introduction

This Neighbourhood Traffic Management Guide (N.T.M.G.) is an update to the 2002 N.T.M.G. which incorporates the latest best-practices in traffic calming, including initiatives made possible through amendments to the Highway Traffic Act (H.T.A.), such as the Safer School Zones Act (Bill 65). This guide aims to illustrate how traffic management can be used to address speeding, excessive traffic volumes, and other traffic safety concerns in neighbourhoods. It also sets out the process that should be followed to identify, validate, rank, and address such concerns.

The 2002 N.T.M.G. was designed to be an internal reference tool for City of Oshawa staff, focusing on detailed descriptions for procedures and extensive terminology with minimal visual aids. The updated N.T.M.G. strives to be more useful and accessible to the public, both by adhering to Accessibility for Ontarians with Disabilities Act (A.O.D.A.) standards and by offering a more streamlined approach.

This N.T.M.G. serves as a public facing educational document and as a resource to guide City staff, illustrating the methodology to address public concerns on topics such as speeding and traffic infiltration in residential areas.

A brief discussion about neighbourhood traffic management and the contents of this guide is provided below.

1.1 What do I do if I notice traffic issues along a road?

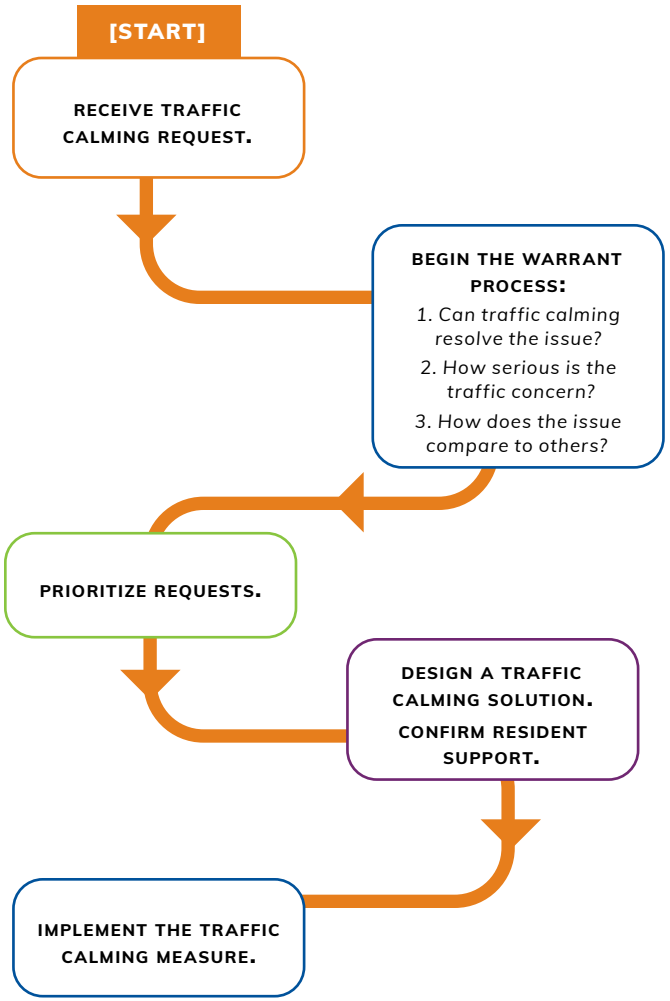
Issues can be submitted to Service Oshawa using the various contact methods listed at **Oshawa.ca** under the Service Oshawa section, **https://www.oshawa.ca/city-hall/service-oshawa.asp**. Service Oshawa can also be reached by phone 905-436-3311 or email **service@oshawa.ca**.

1.2 What is neighbourhood traffic management?

Neighbourhood traffic management (also referred to as traffic calming) is a term used to describe the actions taken to address speeding, excessive traffic volumes, and other safety concerns (e.g., a lack of safe crossing opportunities) on roads in our community. These actions can be implemented on a single street, or on a community-wide scale to deter unwanted driver behaviours and allow all road users to feel more comfortable.

Traffic management can be achieved through a combination of policies, regulations, and / or physical treatments to improve traffic conditions and increase safety for all road users in a specific area. Traffic management policy tools include lower speed limits, Community Safety Zones (C.S.Z.), and crossing guards. Physical traffic calming devices may include raised crosswalks, curb extensions, and speed humps. Traffic calming devices can be implemented as temporary trials or permanent retrofits to existing roads.

Exhibit 1-1: Overview flow chart of traffic calming implementation process.



1.3 What is a Neighbourhood Traffic Management Guide?

A Neighbourhood Traffic Management Guide (N.T.M.G.) is a document that presents traffic management devices used to alter driver behaviour and the processes that govern their eligibility and appropriateness for implementation. Although the N.T.M.G. is intended to assist City Council and Staff in responding to traffic issues throughout the city, it is focused on traffic management at the local community-level.

An established process that guides the receipt of a traffic calming request towards an implemented measure is provided here, with the key steps Illustrated on the left in *Exhibit 1-1*.

The following key elements are included in this version of the N.T.M.G.:

- a new process for reviewing and implementing traffic management in residential neighbourhoods;
- a way to determine where in the city traffic management should be prioritized;
- a framework for designing safer roads in new neighbourhoods;
- a refined toolbox of traffic calming measures that can be installed to improve traffic safety;
- a policy and warrant for 40 km/h speed limits;
- warrants for guiding the establishment of Community Safety Zones; and
- deploying in-road flexible bollards.

2. Traffic Calming Implementation Process

2.1 Traffic Calming Policy and Process Overview

Traffic calming should be used to address concerns related to speeding and / or traffic infiltration, when and where deemed appropriate through the application of the processes and warrants outlined in the N.T.M.G., and the implementation of traffic calming measures should be prioritized based on the relative ranking established via those same processes and warrants, subject to funding availability.

The traffic calming decision making process in this version of the N.T.M.G. considers and conforms to the latest revisions to the Municipal Class Environmental Assessment (M.C.E.A.) Manual (dated 2015)[1], including a streamlined public and stakeholder consultation process, a well-defined warranting process, and an updated toolbox of measures. The traffic calming decision making and implementation process is illustrated in *Exhibit 2-1*, this process is mostly for City staff to undertake with consultation from residents.

Generally, in retrofit situations, it is recommended that temporary / low-cost traffic calming measures (e.g., in-road flexible bollards, curb extensions, pavement markings, portable speed radar signs, etc.) be implemented, evaluated, and adjusted, before more expensive, permanent measures are implemented.

For concerns that relate to pedestrian crossings, the process acknowledges their place in the realm of neighbourhood traffic management; however, the justifications and warrants associated with pedestrian crossing traffic controls, many of which have regulatory standing, are outlined in Book 15[2] of the Ontario Traffic Manual (O.T.M.). Therefore, the traffic calming implementation process defers to the guidance contained in the O.T.M.

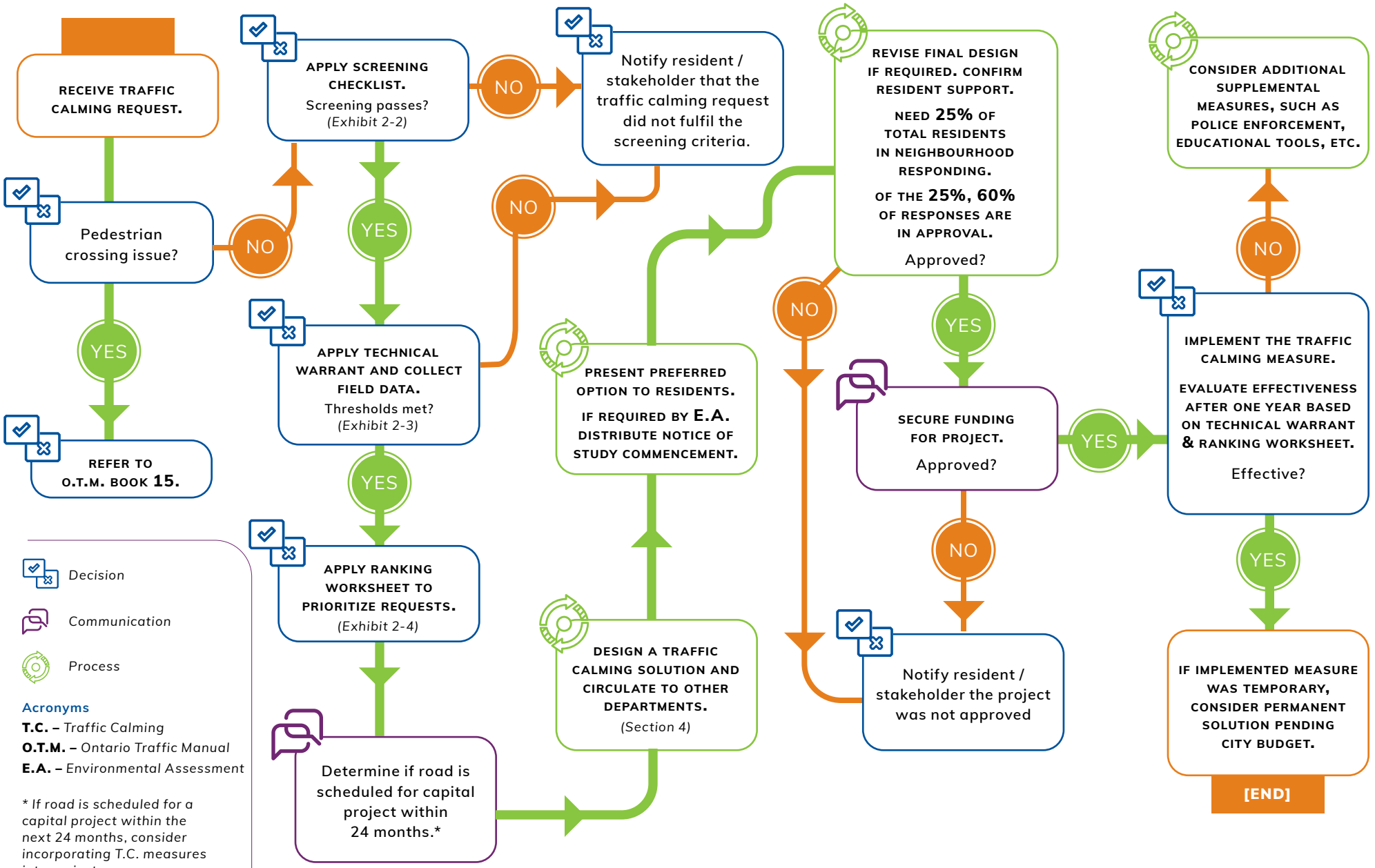
Police enforcement and educational measures are generally viewed by this process, as alternative or supplemental mitigation measures, for use when physical traffic calming measures have been deemed inappropriate or ineffective.

1 **https://municipalclassea.ca/manual/page1.html**

2 **https://www.library.mto.gov.on.ca/SydneyPLUS/Sydney/Portal/default.aspx?component=AAAAIY&record=fa5caef1-9963-4786-b3c9-4b5e50e70321**

Exhibit 2-1: *Proposed Process Flow for Implementing Traffic Calming Measures*

N.T.M.G. PROCESS FLOW FOR IMPLEMENTING CALMING MEASURES



2.2 Warranting Process?

Warrants are an important part of the traffic calming process, as they confirm validity of traffic concerns sent by residents or stakeholders and ensure that City resources are focused only on concerns that can be addressed through the application of traffic calming solutions. Prior to developing a traffic calming solution, three warranting steps must be applied in responding to traffic concerns. These steps include an initial screening, a technical warrant process, and a ranking of the request, which are summarized in the subsections below.

2.2.1 Initial Screening Criteria

This initial step, completed upon receipt of a traffic calming request by a resident or stakeholder, is intended to qualify the received request for further action. The screening criteria are generally focused on determining road jurisdiction, road length, a history of traffic assessments or land use changes in the vicinity, and the nature of the traffic concern. The screening criteria is provided in *Exhibit 2-2.* The criteria are used to verify that:

- The road of interest is under the jurisdiction of the City of Oshawa and located within the urban boundary or part of a hamlet;
- The road segment is of a minimum length, such that speeding can physically occur and traffic calming treatments would not be placed too close to stop signs (or other traffic control devices);
- Any previously N.T.M.G. assessment have been given sufficient time to take effect and to equitably distribute city resources across the City; and
- The nature of the request is such that it can be addressed within the scope of traffic calming measures.

All criteria must be met (responses are “yes”) to pass the initial screening. In the event that any criteria are not fulfiled (response is “no”), the requests could be redirected to another, more appropriate, department to be addressed.

Exhibit 2-2: Recommended Traffic Calming Request Screening Checklist

Initial Screening Checklist			
Criteria #	**Screening Criteria**	**Minimum Requirement**	**Yes / No**
1	City Road	The road is under the jurisdiction of the **City of Oshawa**?	
2	Road Type	The road is within the urban boundary or part of a hamlet (E.g., rural roads are not suitable for N.T.M.G. process. Traffic issues on rural roads will be considered separately by staff on a case-by-case basis.)	
3	Road Length	Area of concern is an uninterrupted road segment (from traffic control device to another traffic control device, e.g., stop sign to stop sign) at least **100 metres long**	
4	History	There have been no N.T.M.G. assessments within the past **36 months,** unless there have been significant road / land use changes nearby that are likely to impact traffic in the area	
5	Nature of Concern	The request is related to speeding, volume / cut-through traffic	
Criteria #1, 2, 3, 4, and 5 met? If YES, then traffic calming request satisfies the screening criteria and should proceed to Step 2 – Technical Warrant			

2.2.2 Technical Warrant Criteria

If a traffic calming request fulfils the initial screening checklist criteria, then the request is reviewed using the technical warrant, provided in *Exhibit 2-3.* This technical warrant contains speeding, volume, and peak hour traffic infiltration thresholds, of which both of the two technical components shall be satisfied to fulfil the warrant.

For Criteria 1, in order to improve consideration for ongoing changes to neighbourhood local contexts, characteristics, and trends, City staff may adjust the speeding technical criteria to reflect the level of speeding tolerance before action is warranted.

For Criteria 2.1, with regards to the average daily traffic (A.D.T.) minimum thresholds, these are sourced from the average annual daily traffic (A.A.D.T.) ranges by the Transportation Association of Canada (T.A.C.) Geometric Design Guide for Canadian Roads, June 2017 (Table 2.6.5).

For Criteria 2.2, infiltration thresholds are based on a comparison of the existing 2002 N.T.M.G. and other municipalities and their traffic calming policies. The equation was adapted from the 2002 N.T.M.G., while trip generation rates are derived from the Institute of Transportation Engineers (I.T.E.) Trip Generation Handbook, 10th edition.

2.2.3 Ranking Criteria

The criteria for ranking confirmed traffic concerns relative to others from across the city are provided in *Exhibit 2-4*, and they include speeds, traffic infiltration levels, truck volumes, collision history, and vulnerable road user exposure. The ratings for all criteria are added to form a total score, which is used to prioritize next steps.

Exhibit 2-3: *Traffic Calming Site Selection – Technical Warrant*

Technical Warrant			
Criteria #	**Technical Component**	**Minimum Requirement**	**Yes / No / N/A**
1	Speeding	**For posted speed limit of 50 km/h or less:** • Observed 85th percentile speed exceeds posted speed limit by 10 km/h? **OR** **For posted speed limit of 60 km/h or more:** • Observed 85th percentile speed exceeds posted speed limit by 12 km/h?	
OR			
2.1	Volume minimum thresholds: Average Daily Traffic (A.D.T.)	**Does the road studied meet or exceed the minimum average daily traffic volume threshold below based on collected data?** *Minimum Average Daily Traffic (A.D.T.):* • Local road: 500 vehicles / day • Collector road: 8,000 vehicles / day • Arterial road: 20,000 vehicles / day	
2.2	Peak Hour Traffic Infiltration	**Does peak hour traffic infiltration exceed 20%?** **Peak hour traffic infiltration % = (B - A) / A * 100%** Where: **B =** Observed peak hour traffic count (weekday a.m. or p.m.) on road segment **A =** Estimated peak hour trips based on # of homes on road segment and other land uses *For A, peak hour trip rates a.m. (p.m.): • 0.74 (0.99) trips per detached house • 0.46 (0.56) trips per low-rise unit (townhouse / condominium / apartment, up to 2 floors) • 0.36 (0.44) trips per mid-rise unit (3 to 10 floors) • 0.31 (0.36) trips per high-rise unit (more than 10 floors) • 0.80 (0.81) trips per student (day care centre) • 0.45 (0.15) trips per student (elementary school) • 0.52 (0.14) trips per student (high school) • 0.15 (0.15) trips per student (university / college)	
Criteria #1 OR # 2 (2.1 and 2.2) fulfiled? If YES, then traffic calming concern satisfies technical warrant requirements. Proceed to Step 3 - Ranking			

** From ITE Trip Generation Handbook, 10th edition (published February 3, 2020).*

Exhibit 2-4: *Traffic Calming Site Selection – Ranking Worksheet*

Ranking Worksheet		
Criteria	**Minimum Requirement**	**Rating**
Speed	Observed 85th percentile speed: • 1 point for each km/h above posted speed limit	0-25
Peak Hour Traffic Infiltration %	Peak hour traffic infiltration percentage: • 1 point for each % exceeding 20%. **Calculation:** • Peak hour traffic infiltration % = (B-A) / A * 100% **Where:** • **B =** Observed peak hour traffic count (weekday a.m. or p.m.) on road segment* • **A =** Estimated peak hour trips (I.T.E. Trip Generation Handbook Method(10th Edition, 2017)) based on # of homes of road segment and other land uses ***For A, peak hour trip rates a.m. (p.m.):** • 0.74 (0.99) trips per detached house • 0.46 (0.56) trips per low-rise unit (townhouse / condominium / apartment, up to 2 floors) • 0.36 (0.44) trips per mid-rise unit (3 to 10 floors) • 0.31 (0.36) for high-rise unit (more than 10 floors) • 0.80 (0.81) trips per student (day care centre) • 0.45 (0.15) trips per student (elementary school) • 0.52 (0.14) trips per student (high school) • 0.15 (0.15) trips per student (university / college)	0-15
Truck Volume	1 point for each % that truck traffic volumes represents greater than 2% of 24 hour traffic volumes	5

<table>
<tr><th colspan="5">Ranking Worksheet</th></tr>
<tr><th>Criteria</th><th colspan="3">Minimum Requirement</th><th>Rating</th></tr>
<tr><td rowspan="8">Collision Rate</td><td colspan="3">Collision rate, R:
• 1 point if R ≥ 2.5** (motorized vehicle related only)
– Add 1 additional point for each subsequent increase of +1.5, up to 9 points,</td><td rowspan="8">0-10</td></tr>
<tr><td colspan="3">OR</td></tr>
<tr><td colspan="3">• 10 points if R > 0 (cyclist or pedestrian related)
Calculation:
$$R = \frac{1{,}000{,}000 \times C}{365 \times N \times V \times L}$$</td></tr>
<tr><td>Variable</td><td>Usage for Road Segment</td><td>Usage for Intersection</td></tr>
<tr><td>R</td><td>Collisions per 1 million vehicle kilometres of travel</td><td>Collisions per 1 million entering vehicles</td></tr>
<tr><td>C</td><td colspan="2"># of collisions for the years studied
(3 years minimum suggested)</td></tr>
<tr><td>N</td><td colspan="2"># of years of data (3 years minimum suggested)</td></tr>
<tr><td>V</td><td># of vehicles per day (both directions)</td><td># of vehicles entering the intersection per day</td></tr>
<tr><td>L</td><td>Length of studied road segment (normalize for 0.1 km)</td><td>Enter “1” for intersection</td></tr>
</table>

Ranking Worksheet		
Criteria	**Minimum Requirement**	**Rating**
Vulnerable Road Users	5 points if there are no protected (separated) walking or cycling facilities (e.g. sidewalks, multiuse path)	5
	5 points for each nearby pedestrian generator (school, universities, colleges, churches, playground, park, community centre, libraries, retail centres) fronting the road	0-10
	TOTAL SCORE	/ 70

*** Based on single-tier municipality median collision rate / collisions per million vehicle kilometre, from City of Toronto Road Services 2017 Performance Measurement & Benchmarking Report*[3]

If the traffic concern at hand fulfils the screening checklist and technical warrant, and has been prioritized by the ranking worksheet, it will be eligible to be resolved through traffic calming. The types of traffic calming measures used to address a warranted issue are outlined in Section 4.

3 **https://www.toronto.ca/wp-content/uploads/2019/06/98ec-RoadServices2017-PMBR-Final-AODA.pdf**

3. Guiding Principles

There are several guiding principles for naturally calmed roads (i.e., roads that encourage driving behaviours that are compatible with the comfort and safety of other road users), which illustrate the interrelated nature of community layout, traffic calming elements, and engineering design standards. These themes are discussed in the paragraphs below, and can be applied to retrofit existing neighbourhood roads, as well as to guide the development of new communities.

3.1 Use the Right Tools for the Job (Traffic Calming Versus Traffic Control)

The concepts behind traffic calming and traffic control are often confused to be identical methods for reducing unsafe driver behaviour, such as speeding. In reality, traffic control is used to direct, guide, and inform road users as they travel from one location to another. Examples of traffic control devices include stop signs, posted speed limits, traffic signals, and pavement markings.

The overuse of stop signs in unwarranted locations can lead to unsafe side affects at surrounding areas, such as driver frustration, lowered compliance of other nearby signs, and aggressive driving to make up for lost time.

Traffic calming on the other hand, is used to encourage safer and more responsible driving behaviour by reducing speeds and cut-through traffic. Examples of traffic calming measures include education, enforcement, and engineering, including speeds hump, curb extensions, and traffic circles.

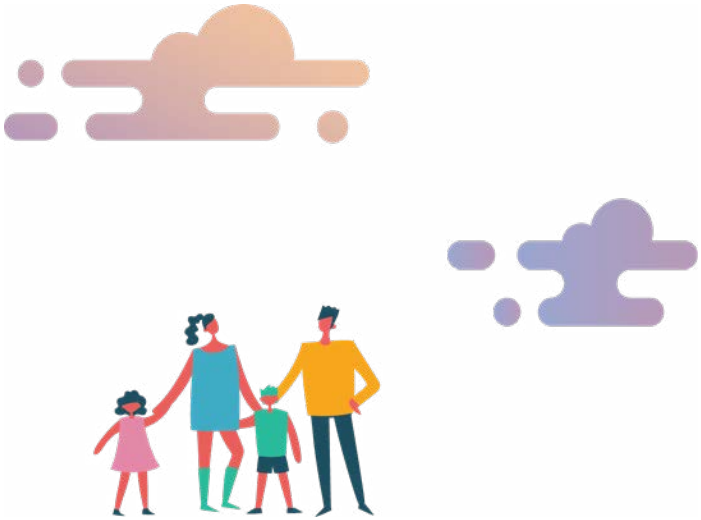


Image Location: *Oshawa, Ontario*
Image Source: *City of Oshawa*

3.2 Elevating Active Transportation

Naturally calmed roads have dynamic curbside activity – in the form of pedestrians and bicyclists – which encourages more cautious driving and slower vehicle speeds. Within the travelled portion of the road, naturally calmed roads encourage cycling by accommodating bicycle infrastructure. On the boulevard, pedestrian sidewalks should be included. At crosswalks and pedestrian crossovers, curb extensions, elevated crosswalks, and other elements can be used to increase the visibility and priority of vulnerable road users.

Image Location: *Rochester Hills, Michigan*
Image Source: *Bousfields Inc.*

3.3 Integrating Traffic Calming into Intersections

Naturally calmed roads are often found in communities with short, regular blocks, where intersections present an opportunity to integrate traffic calming at common conflict points. Integrating traffic calming into intersections can establish a change from a higher-speed, higher-volume operating environment, to one with lower speeds, and can address concerns with through-traffic speeds, turning behaviour, and pedestrian crossing safety. Traffic calming can be added to existing intersections or integrated into the design of new ones.

At intersections, careful consideration is critical when deciding on the appropriate use of traffic calming measures, and to avoid confusing or inappropriate use of traffic control devices. At intersections, traffic control devices serve to provide direction on right-of-way (e.g., stop signs) or prohibited movements (e.g., no right-turn on red signs). If improperly used, these devices can become ineffective or ignored. Traffic calming measures, by comparison, serve to discourage certain driver behaviours (e.g., speeding, traffic infiltration), often by physically blocking or constraining movements.

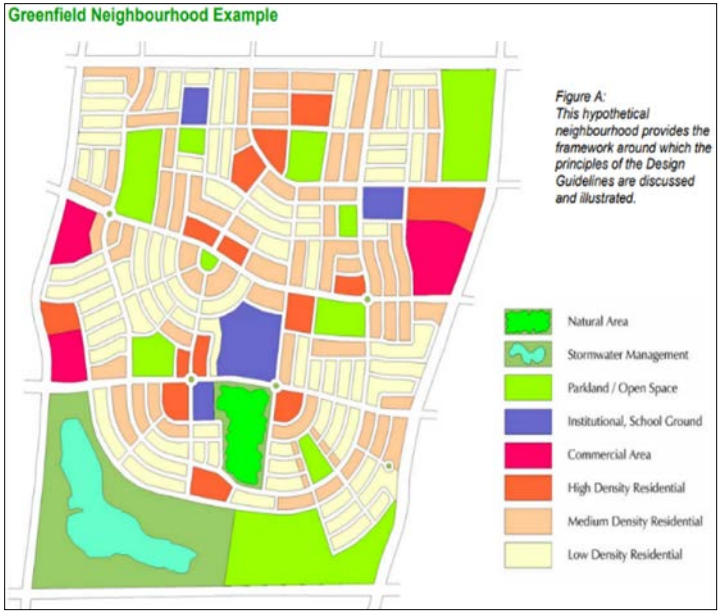


Image: *Greenfield Neighbourhood Example*
Image Source: *City of Oshawa*

3.4 Design Compact Communities

Land use decisions have a profound impact on driver behaviour, with many instances of undesirable road-user behaviour stemming from auto-oriented neighbourhood layouts; and long, circuitous travel paths from origins to destinations. Naturally calmed roads tend to be located in transit supportive communities with prominent non-automobile travel options, and in communities with short, regular blocks that minimize travel times to and from the broader road network.

Image Location: *Vancouver, British Columbia*
Image Source: *City of Oshawa*

3.5 Use the Appropriate Road Design

Many instances of undesirable road-user behaviour stem from road designs that enable higher operating speeds than would otherwise be appropriate for the context. For example, a design typology with a 50 – 60 km/h design speed intended for collector roads is sometimes used despite a desire for operating speeds to be more consistent with a 30 – 40 km/h local road. Naturally calmed roads use design elements which are appropriate for the desired operating speed and the road's intended role within the community.

Retrofitting existing neighbourhoods can be accomplished via road diet solutions, such as providing curb extensions, bicycle lanes, and / or widened sidewalks after reducing the width of road lanes. New developments should ensure that their road designs are aligned with the target operating speeds, while existing developments can implement these retrofitting elements to help bring operating speeds to an appropriate level.

3.6 New Development Checklist

The New Development Street Planning Checklist, provided in *Exhibit 3-1*, was created to assist developers with integrating traffic calming measures into their projects, and to provide City staff with the tools required to review the resulting designs.

For developers, this checklist is not intended to be prescriptive or inflexible. Rather, the guidance presented is intended to be interpreted and applied in a context-sensitive manner.

For staff, the checklist is not intended to score a development proposal, and the absence of certain elements should not be interpreted as a proposal being inherently deficient. Rather, the checklist is intended to assist reviewers in determining the likelihood that a new development will experience conditions which may require traffic calming retrofits in the future.

It should be noted that achieving naturally calm streets may require allowances for road design elements which differ from municipal standard drawings and other traditional conventions. Additionally, context sensitive guidance may be required to support broader municipal objectives and to confirm that the proposed measures will not have a significant adverse impact on road-user safety, emergency vehicle access or transit movements. Where deviations from local standards are being proposed, the proposals should include documentation of the associated justifications and an assessment of risks.

Exhibit 3-1: New Development Checklist

GUIDELINE	PROVIDED	NOT PROVIDED	APPLICANT'S NOTES	REVIEWER'S NOTES
Neighbourhood Road Structure				
Have you established a hierarchy of roads?				
Are intersections spaced apart approximately 150 to 250 metres?				
Have you designated routes for future transit?				
Does the neighbourhood road structure discourage cut-through traffic?				
Have you considered adjacent land uses in determining road design / streetscaping elements?				
Road Cross Section				
Have you minimized pavement width by introducing active transportation or other traffic calming elements?				
Have you provided horizontal or vertical deflection traffic calming elements along blocks longer than approximately 250 to 300 metres?				
If used, have you selected the municipal standard drawings for the road design with the lowest practical design speed?				

GUIDELINE	PROVIDED	NOT PROVIDED	APPLICANT'S NOTES	REVIEWER'S NOTES
Arterial Roads				
Have you located new buildings adjacent to arterial roads, and oriented active uses (e.g. main building entrance) towards the arterial road frontage?				
Have you provided wide sidewalks and / or multi-use paths and separated the sidewalk from the road using streetscape elements?				
Have you provided bicycle infrastructure with separation from vehicle lanes?				
Collector Roads				
Have you designed for on-street parking on both sides of the road, where possible / feasible?				
Have you provided bicycle infrastructure on both sides of the road, where possible / feasible?				
Local Roads				
Have you designed for bicycle movement as a normal component part of road traffic?				
Have you designed for on-street parking on both sides of the road?				
Lanes / Private Neighbourhood Roads				
Have you provided additional intersection connection points to lanes longer than approximately 250 to 300 metres?				

GUIDELINE	PROVIDED	NOT PROVIDED	APPLICANT'S NOTES	REVIEWER'S NOTES
Active Transportation Network				
Have you provided sidewalks on the street?				
Have you designed crosswalks to be visually different from the street surface?				
Have you provided for a network of bicycle routes that connect to the city-wide network?				
Have you provided curb extensions and / or raised crosswalks at trail crossing locations and pedestrian crossovers?				
Intersections				
Have you provided neighbourhood gateway elements such as landscaping in the boulevard and median?				
Have you provided curb extensions at intersections?				
Have you provided raised intersections?				
Have you provided roundabouts?				

4. Traffic Calming Measure Toolbox

The following pages outline multiple traffic calming measures through renderings, examples, cost of implementation, advantages / disadvantages, and temporary measures. These measures can be used to decrease vehicle speeds, lower volumes, and also improves comfort and safety by reducing vehicle-vehicle, vehicle-pedestrian and vehicle-cyclist conflicts. The range of measures provided in the toolbox allows the City of Oshawa to customize projects to match the needs of the community.

A summary table of potential traffic calming measures is presented in *Exhibit 4-1*. The various measures have been categorized based on the mechanisms by which they seek to calm traffic. The summary table also provides a relative assessment of associated advantages and disadvantages, as well as an indication of the eligible road classifications for each measure.

Exhibit 4-1: *Traffic Calming Measure*

Measures	Potential Advantages			Potential Disadvantages			Road Classification		
	Speed Reduction	Volume Reduction	Conflict Reduction	Emergency Response	Active Transportation	Maintenance	Local	Collector	Arterial
Vertical Measures									
Raised Intersection	●	○	◉	◉	◉	◉	✓	✓	×
Speed Cushion	●	◉	●	◉	◉	◉	✓	✓	×
Speed Hump	●	◉	●	●	◉	◉	✓	✓	×
Horizontal Measures									
Chicane	●	●	●	◉	◉	◉	✓	✓	×
Curb Extension	◉	○	○	○	◉	◉	✓	✓	✓
Curb Radius Reduction	◉	○	○	○	◉	◉	✓	✓	✓
On-Street Parking	◉	○	○	◉	◉	◉	✓	✓	×
Raised Median Island	◉	○	◉	○	○	◉	✓	✓	✓
Traffic Circle	●	◉	●	◉	◉	◉	✓	✓	×
Flexible Bollards	◉	○	◉	○	◉	●	✓	✓	×
Obstruction Measures									
Directional Closure	●	●	◉	◉	◉	◉	✓	✓	×
Diverter	○	●	◉	◉	◉	◉	✓	✓	×
Full Closure	○	●	●	●	◉	◉	✓	✓	×
Regulatory Measures [1]									
C.S.Z.	●	◉	◉	○	○	○	✓	✓	✓
40 km/h Speed Limit Area	●	○	◉	○	○	○	✓	✓	✓
Others									
Pavement Markings [2]	●	○	○	○	○	◉	✓	✓	✓
Radar Message Board	◉	○	○	○	○	◉	✓	✓	×

Symbol	Level of Impact
○	Low/None
◉	Medium
●	High

[1] *Effectiveness of regulatory measures are dependent on enforcement*

[2] *Various pavement markings have different levels of impacts for "Speed Reduction", the upper ranges of speed reduction effectiveness was cited*

Raised Intersection

Vertical Measure

A raised intersection is an intersection at a higher elevation than roads to reduce vehicle speed and better define pedestrian cross-walk areas.

Primary Purpose

Speed Reduction

Cost Estimate

$50,000 - $100,000

Case Studies

Newmarket

Signage

N.A.C.T.O. rendering of raised intersection

Example of raised intersection

Applicability

- **Road Classification:** Local and collector roads
- **Traffic Conditions:** Posted speed limit ≤ 50 km/h
- **Avoid:** Emergency access routes

Design Constraints

- **Height:** Equal to adjacent sidewalks
- **Slope of Ramp:** ≤ 6%
- **Slope:** ≥ 1% in all drainage areas
- Speed hump signs are not required on Stop sign approaches

Impacts

- **Environmental:** Traffic noise may be reduced due to lower speeds
- **Safety:** Lower speeds and an increase in yielding from drivers provides safety for pedestrians

Advantages

- **Speed Reduction:** Reductions in 85th percentile speed up to 10 km/h
- **Conflict Reduction:** Rise from 18% to 54% of drivers yielding to pedestrians

Disadvantages

- **Emergency Response:** Slows emergency vehicles to about 25 km/h
- **Maintenance:** Snow plowing/removal negatively effected due to need for careful maneuvering

Speed Cushion

Vertical Measure

Similar to a speed hump, a speed cushion is a raised area of road but does not cover the whole road width requiring passenger vehicles to limit speeds while larger vehicles can "straddle" the cushions and pass with no difficulty.

Temporary Measure

Primary Purpose

Speed Reduction

Cost Estimate

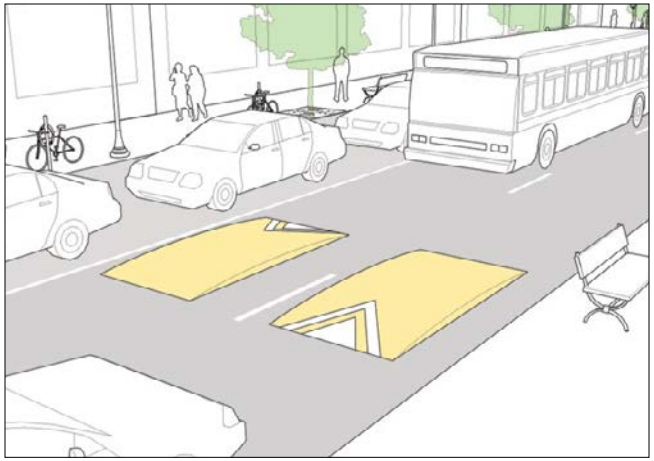
$4,000 - $6,000

Case Studies

Mississauga

Signage

Installed facing traffic immediately adjacent to speed cushion



N.A.C.T.O. rendering of speed cushions

Example of speed cushion

Applicability

- **Road Classification:** Local and collector roads
- **Traffic Conditions:** Posted speed limit ≤ 50 km/h
- **Avoid:** Small turning radius curves and areas with limited sight distance

Design Constraints

- **Grade:** ≤ 8%
- **Traffic Signals:** Locate at least 75 m in advance
- **Spacing: Between sets:** 60 m to 250 m
  Between cushion and curb: 0.6 m
  Between cushions: ≥ 1.5 m
- **Width:** 1.8 m

Impacts

- **Environmental:** Traffic noise may be reduced due to lower speeds
- **Safety:** Does not disrupt emergency vehicle response times

Advantages

- **Speed Reduction:** Reductions in 85th percentile speed up to 8 km/h
- **Volume Reduction:** Reductions of approximately 30%

Disadvantages

- **Construction:** More difficult to construct than speed humps due to more precision work
- **Maintenance:** Snow plowing/removal negatively effected due to need for careful maneuvering

Speed Humps

Vertical Measure

A speed hump is a raised area of road designed to cause discomfort for drivers travelling at higher speeds.

Primary Purpose

Speed Reduction

Cost Estimate

$1,000 - $5,000

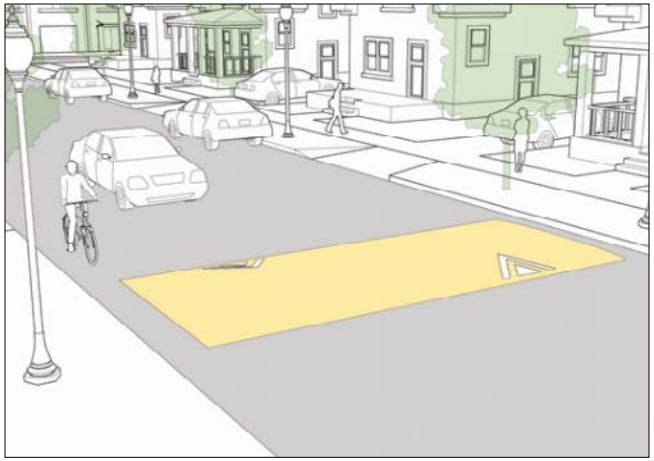
Case Studies

Markham

Vaughan

Signage

Installed facing traffic immediately adjacent to speed hump



N.A.C.T.O. rendering of speed hump

Example of speed hump

Applicability

- **Road Classification:** Local and collector roads
- **Traffic Conditions:** Posted speed limit ≤ 50 km/h
- **Avoid:** Small turning radius curves

Design Constraints

- **Grade:** ≤ 8%
- **Bus Stop:** Locate at least 25 m in advance
- **Traffic Signals:** Locate at least 75 m in advance
- **Spacing:** 80 m to 150 m is recommended
- **Height:** 80 mm

Impacts

- **Environmental:** Traffic noise may be reduced due to lower speeds
- **Safety:** Decreases the number of injury accidents by up to 40%

Advantages

- **Speed Reduction:** Reductions in 85th percentile speed between 6 and 13 km/h
- **Volume Reduction:** Reductions between 15% and 27%

Disadvantages

- **Emergency Response:** Response times delayed between 2.3 and 15 seconds
- **Maintenance:** Snow plowing/removal negatively effected due to need for careful maneuvering

Chicane

Horizontal Measure

A chicane is a series of curb extensions on alternate sides of a road which narrow the road and require drivers to steer in an S-shape, therefore reducing the vehicles speed and through traffic.

Temporary Measures

Primary Purpose

Speed Reduction

Cost Estimate

$15,000 - $50,000

Case Studies

Toronto

Signage

Needed for two-way one lane chicane

N.A.C.T.O. rendering of chicane

Example of chicane

Applicability

- **Road Classification:** Local (one-way and two-way) and collector roads (two-way)
- **Traffic Conditions:** Posted speed limit ≤ 50 km/h
  Minimum 750 veh/day or 100 veh/hr during peak hour

Design Constraints

- **Grade:** ≤ 8%
- **Driveways:** Avoid if possible
- **Traffic Volumes:** Traffic volumes should be similar in both directions (for two-ways) for greatest effectiveness
- **Drainage:** Chicanes may need to be offset from curbs to maintain proper drainage

Impacts

- **Environmental:** Traffic noise may be reduced due to lower speeds
- **Safety:** Collision reduction up to 40%

Advantages

- **Speed Reduction:** Reductions between 6 and 11 km/h
- **Volume Reduction:** Reductions up to 47%

Disadvantages

- **Parking:** Loss of on-street parking, no parking in and within 5 m of chicane
- **Maintenance:** Parked vehicles may obstruct maintenance such as street sweeping and snow removal

Curb Extension

Horizontal Measure

A curb extension is a horizontal intrusion into the road resulting in a narrow section. The narrowed road causes a driver to feel confined, resulting in lower speeds.

Temporary Measures

Primary Purpose

Speed Reduction

Cost Estimate

$50,000 - $100,000

Case Studies

Toronto

Signage

N.A.C.T.O. rendering of curb extension

Example of curb extension

Applicability

- **Road Classification:** Local and collector roads, urban arterial streets
- **Traffic Conditions:** All traffic volumes
- **Avoid:** Small turning radius curves

Design Constraints

- **Drainage System:** Drainage system adjustments may be necessary in location of extension
- **At Intersection:** Approach lane ≥ 2.5 m
  Departure: lane ≥ 3 m
  Length: 5 - 7 m
- **Mid-Block Extension:** Lane ≥ 2.75 m
  Length ≥ 7 m
- **Extension:** ≥ 2 m

Impacts

- **Environmental:** Can improve street appearance
- **Safety:** Cyclists and vehicles are pushed closer together

Advantages

- **Speed Reduction:** Reductions between 2 and 8 km/h
- **Conflict Reduction:** Reduces pedestrian crossing distance

Disadvantages

- **Active Transportation:** Not compatible with bike lanes
- **Large Vehicles:** Large vehicles may need to cross into oncoming lanes

Curb Radius Reduction

Horizontal Measure

A curb radius reduction is an intersection corner with a reduced radius, which slows down right-turning vehicles. This reduces crossing distances for pedestrians and improves visibility of pedestrians.

Primary Purpose

Speed Reduction

Cost Estimate

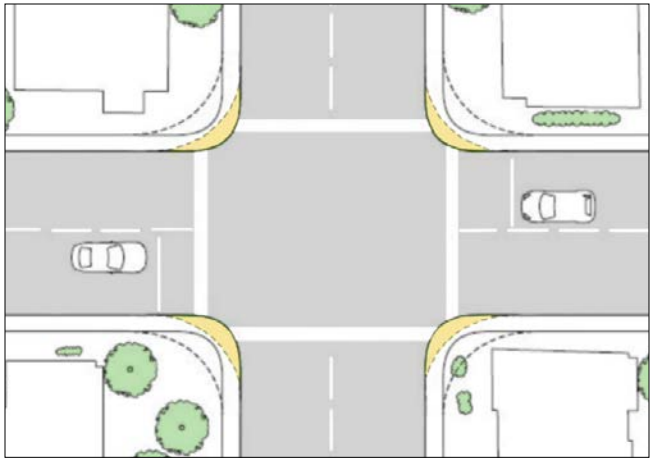
$50,000 - $100,000

Case Studies

Davenport Road & Christie Street, Toronto. Reduced conflict rates and the speed of turning vehicles involved in conflicts[1]

Signage

Only in combination with curb extension



City of Toronto rendering of curb radius reduction

Example of curb radius reduction

Applicability

- **Road Classification:** Local, collector, and low volume arterial roads
- **Traffic Conditions:** Use with caution when > 10,000 veh/day
- **Avoid:** Truck, transit, and emergency vehicle routes

Design Constraints

- **Radius:** Typically 3 - 5 m
- Implications of chosen radius on larger vehicles must be checked
- Curb extensions may be used as a complimentary traffic calming measure

Impacts

- **Aesthetics:** Increase of space allows for more room to enhance streetscape
- **Safety:** Reduced pedestrian crossing distance and improved visibility of pedestrians

Advantages

- **Speed Reduction:** Reduction in right-turning vehicles
- **Conflict Reduction:** Reduced pedestrian crossing distance

Disadvantages

- **Large Vehicles:** May need to cross into adjacent lanes in order to make turns
- **Maintenance:** Extra maintenance may be needed due to vehicles mounting the curb

1. **Impact of Curb Radius Reduction on Pedestrian Safety: A Before-After Surrogate Safety Study in Toronto by Brisk Synergies Tech Corp**

On-Street Parking

Horizontal Measure

On-street parking allows vehicles to park parallel to curb, effectively reducing the width of the road. This reduces vehicle speed and through traffic.

Temporary Measures

- Temporary signage may be used to allow parking
- A temporary cover on prohibited parking signs may be used to indicate that parking is available

Primary Purpose

Speed Reduction

Cost Estimate

$1,000 - $5,000

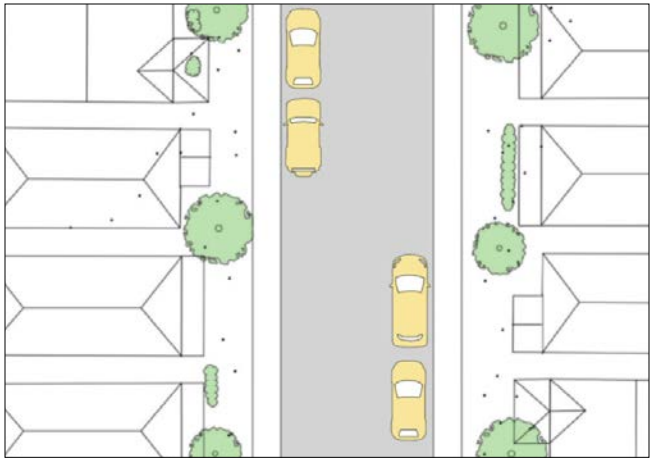
Case Studies

Toronto

Signage

If curb extensions are used to define a parking area, signage for curb extensions should be used.

Used in areas with minimum pavement width



City of Toronto rendering of on-street parking

Example of on-street parking

Applicability

- **Road Classification:** Local and collector roads
- **Traffic Conditions:** All traffic volumes
- **Avoid:** Areas with limited sight distance, drive-ways, bus zones and designated school zones

Impacts

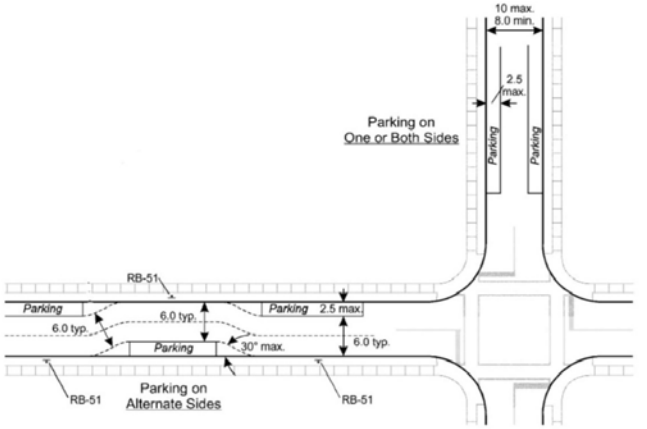
- **Environmental:** Traffic noise may be reduced due to lower speeds
- **Safety:** May increase rear-end or sideswipe collisions

Advantages

- **Speed Reduction:** Limited data
- **Volume Reduction:** Limited data
- **Conflict Reduction:** Creates buffer between pedestrians on sidewalks and traffic

Disadvantages

- **Conflict:** Requires a minimum width in order for cyclists to safely pass around opened car doors
- **Maintenance:** Parked vehicles may obstruct maintenance, such as street sweeping and snow removal



Raised Median Island

Horizontal Measure

A raised median island is a raised median in the centreline of a two-way road. This reduces the travel lane width, causing a reduction in vehicle speeds.

Primary Purpose

Speed Reduction

Cost Estimate

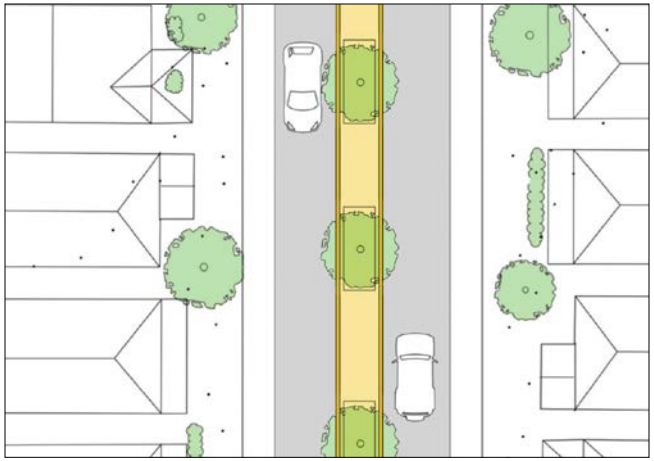
$15,000 - $50,000

Case Studies

Pickering

Toronto

Signage



City of Toronto rendering of raised median island

Example of raised median island

Applicability

- **Road Classification:** Local and collector roads, urban arterials
- **Traffic Conditions:** All traffic volumes

Design Constraints

- **Length:** ≥ 5 - 7 m
- **Lane width:** ≤ 3.5 m
- **Median width:** ≥ 1.5 m
- Works best on roads with two-way traffic
- Effectiveness can be increased if used in combination with curb extensions

Impacts

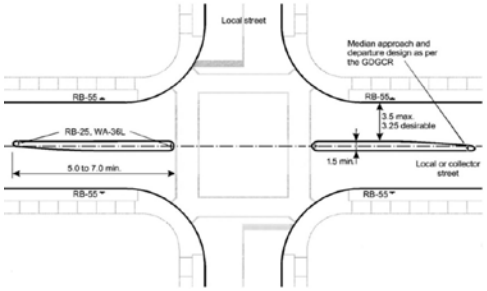
- **Environmental:** Aesthetic benefits if well kept
- **Safety:** Decrease vehicle-pedestrian conflict by acting as a refuge

Advantages

- **Speed Reduction:** Reductions between 3 and 8 km/h
- **Volume Reduction:** No data

Disadvantages

- **Local Access:** May block drive-ways from one direction
- **Active Transportation:** Cyclist may feel uncomfortable due to lack of space



Traffic Circle

Horizontal Measure

A traffic circle is an island located in the centre of an intersection which causes drivers to travel through the intersection in a counter-clockwise direction.

Temporary Measures

Primary Purpose

Speed Reduction

Cost Estimate

$15,000 - $50,000

Case Studies

Ancaster

Toronto

Signage

N.A.C.T.O rendering of traffic circle

Example of traffic circle

Applicability

- **Road Classification:** Local and collector roads
- **Traffic Conditions:** Posted speed limit ≤ 50 km/h <1500 veh/day
- **Avoid:** Intersections with high pedestrian traffic

Design Constraints

- **Dimensions:** Dependent on road width
- **Raised Island:** Locate at least 25 m in advance
- **Traversable Island:** Height ≤ 125 mm
- **Slope:** 5 - 6 %

Impacts

- **Environmental:** Traffic noise may be reduced due to lower speeds
- **Safety:** Collision rate reduction of approximately 30%
- Potentially increases pedestrian-vehicle conflict by forcing vehicles into cross-walk area

Advantages

- **Speed Reduction:** Reductions in 85th percentile speed up to 14 km/h
- **Volume Reduction:** Reduction up to 20%

Disadvantages

- **Emergency Response:** Response times delayed between 1 and 10 seconds
- **Large Vehicles:** Restricts movement due to less intersection space

Flexible Bollards

Temporary Measure

A flexible bollard is a rubber post placed in the center of a road in order to make drivers uncomfortable travelling at high speeds due to less space on the road.

Primary Purpose

Speed Reduction

Cost Estimate

less than $2,000

Case Studies

Newmarket

Signage

Example of a flexible bollard with delineators

Example of a flexible bollard with delineators

Applicability

- **Road Classification:** Local and collector roads
- **Traffic Conditions:** All traffic volumes
- **Avoid:** Close proximity to stop signs

Impacts

- **Environmental:** Traffic noise may be reduced due to lower speeds
- **Safety:** Decrease speeds may result in decrease in accidents and severity of accidents

Advantages

- **Speed Reduction:** Reductions between 2 and 5 km/h
- **Volume Reduction:** No data
- **Safety:** Minimal to no damage to vehicles if bollard is struck
- May be used to create temporary curb extensions and / or chicanes

Disadvantages

- **Maintenance:** May need to install for spring and uninstall for winter

If kept installed for winter, may be damaged by snowplow

Directional Closure

Obstruction Measure

A directional closure is a curb extension or barrier which extends to the centreline of the road in order to prohibit traffic in one direction of travel.

Temporary Measures

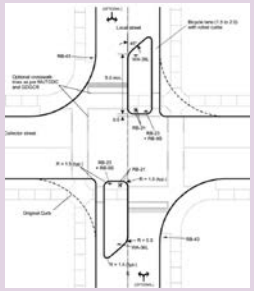
Primary Purpose

Volume Reduction

Cost Estimate

$15,000 - $50,000

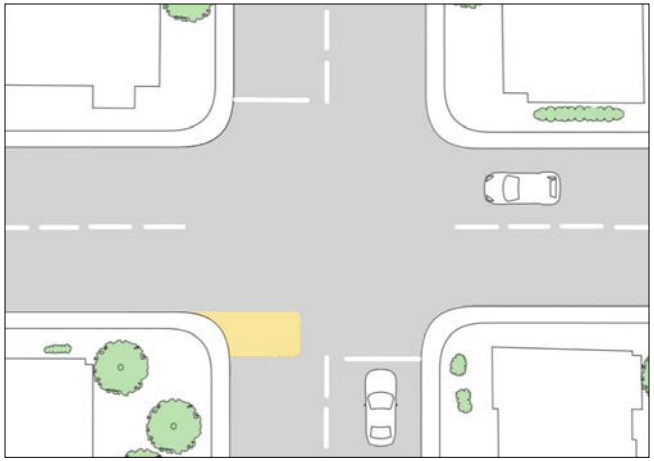
Entrance Only Design



Signage

Exit-only closure

Entrance-only closure



Rendering demonstrating directional closure

Example of a directional closure sign

Applicability

- **Road Classification:** Local and collector roads
- **Traffic Conditions: local roads:** <1500 veh/day
- **Collector roads:** 1500 - 5000 veh/day

Design Constraints

- **Drainage:** Drainage system adjustments may be required
- **Spacing between Closure and Curb:** 1.5 - 2 m
- **Exceptions:** Exceptions can be made for bicycles, requires signage

Impacts

- **Environmental:** Traffic noise may be reduced due to lower traffic volume
- **Safety:** Decrease of pedestrian-vehicle conflict due to reduced crossing distance

Advantages

- **Speed Reduction:** Reductions in 85th percentile speed up to 11 km/h
- **Volume Reduction:** Reductions up to 60% or 100% in one direction

Disadvantages

- **Local Access:** Restricts access to local residents
- **Traffic:** Traffic may be diverted to other streets without closure
- **Services:** May affect garbage collection routes

Diverter

Obstruction Measure

A full closure is a barrier which covers the entire width of the road, blocking vehicles from traveling along the road.

Temporary Measures

Primary Purpose

Volume Reduction

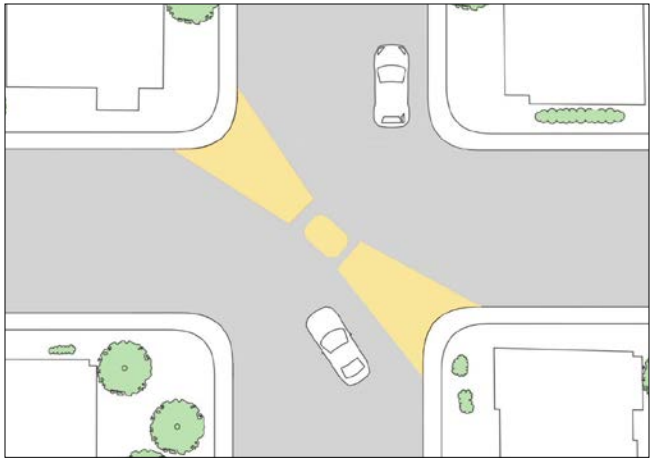
Cost Estimate

$50,000 - $100,000

Diverter Design

Toronto

Signage



Rendering demonstrating diverter

Example of a diverter

Applicability

- **Road Classification:** Local and collector roads
- **Traffic Conditions:** ≤ 5000 veh/day
  Use with caution with ≥ 1500 veh/day

Design Constraints

- **Diversion Alignment:** Must have sufficient space and radius for all vehicle turning paths
- **Parking:** Should not be permitted within diversion
- **Bike Access:** Openings of 1.5 - 2 m width

Impacts

- **Environmental:** Traffic noise may be reduced traffic volume
- **Safety:** Motorists may not foresee cyclists who enter intersection through the barrier
- **Maintenance:** May make sweeping and snow removal more difficult

Advantages

- **Speed Reduction:** No significant effect
- **Volume Reduction:** Area wide reductions between 20% and 70%
- **Conflicts:** Reduces conflict points

Disadvantages

- **Emergency Response:** May restrict emergency access unless designed to be passable
- **Local Access:** Restricts access to local residents
- **Services:** May affect garbage collection routes
- **Environmental Impact:** Potentially increases trip times for vehicles

Full Closure

Obstruction Measure

A full closure is a barrier which covers the entire width of the road blocking vehicles from traveling along the road.

Temporary Measures

Primary Purpose

Volume Reduction

Cost Estimate

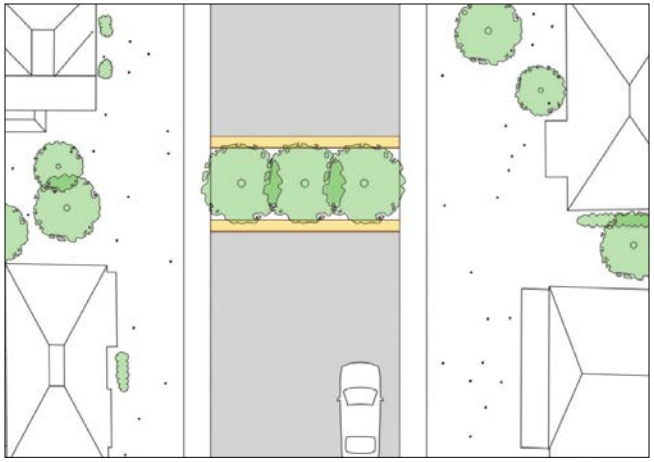
$50,000 - $100,000

Case Studies

Toronto

Signage





Rendering demonstrating full closure

Example of road full closure

Applicability

- **Road Classification:** Local roads
- **Traffic Conditions:** All traffic volumes
- **Avoid:** Designated emergency routes

Design Constraints

- **Cul-de-Sac:** Must be provided at end of road
- **Obstructions:** Trees and bollards should be placed to discourage off-road travel
- **Bike Access:** Openings of 1.5 - 2 m width

Impacts

- **Environmental:** Traffic noise may be reduced traffic volume
- **Safety:** Motorists may not foresee cyclist who enter intersection through the barrier

Advantages

- **Speed Reduction:** No significant effect
- **Volume Reduction:** Eliminates all shortcutting or through traffic
- **Conflicts:** Reduces conflict points

Disadvantages

- **Emergency Response:** May restrict emergency access unless designed to be passable
- **Local Access:** Restricts access to local residents
- **Parking:** May require parking prohibition near closure
- **Environmental Impact:** Potentially increases trip times for vehicles

Community Safety Zone (C.S.Z.)

Regulatory Measure

A C.S.Z. is a marked and designated portion of a road, where the community and municipality have determined that road safety is a concern.

Primary Purpose

Speed Reduction

Cost Estimate

$75 - $200 per sign

Recognized under the Provincial Highway Traffic Act (H.T.A.)

- Recognition from the H.T.A. allows fines for speeding, distracted driving and similar offences to double within these zones
- H.T.A. states that C.S.Z. are eligible for Automated Speed Enforcement (A.S.E.)
- Seniors' centres and residences
- High pedestrian traffic locations

Signage

Example of C.S.Z. signage

Example of C.S.Z. signage in Point Edward

How to implement a C.S.Z.

- At least one criterion from Warrant A (Designated Areas of Special Consideration) must be met
- At least one criterion from Warrant B (Safety) must be met
- A risk factor of 16 or more must be met, determined by the C.S.Z. Warrant Risk Factor Scoring Table

Factors to consider

- C.S.Z. designation can be extended up to 150 m beyond the boundary of the frontage of the facilities
- C.S.Z. designations only take effect when municipal by-laws are in place and related signs are posted

Automated Speed Enforcement

- A.S.E. is an automated system which uses a camera and a speed measurement device to enforce the posted speed limit
- Images captured by the A.S.E. are stored and reviewed by a provincial offences officer

Possible Locations for C.S.Z.

- Elementary or secondary schools
- Universities or colleges
- Licensed childcare facilities
- City parks
- Community centres and churches

40 km/h Speed Limit Area (S.L.A.)

Regulatory Measure

A 40 km/h S.L.A. is a policy tool aimed at lowering speed limits across a neighbourhood or specific areas of a road network.

Primary Purpose

Speed Reduction

Cost Estimate

$75 - $200 per sign

Provincial Highway Traffic Act (H.T.A.)

- Amendments to the Ontario H.T.A. now allow municipalities to designate these areas by passing a by-law
- If the speed limit area is within a C.S.Z. and / or School Zone, the speed limit is eligible to be enforced through Automated Speed Enforcement (A.S.E.)

Signage

Example of Area Speed Limit Sign

Example of Area Speed Limit Sign

How to implement a S.L.A.

- Meets the 40 km/h Speed Limit Warrant if on collector and / or arterial roads
- The 40km/h Speed Limit Warrant can also be used to prioritize their implementation

Factors to consider

- Signage is only needed at entry and exit points of these areas, minimizing the number of signs needed overall
- Community petitions are not required
- Applicable to local, collector and arterial roads
- S.L.A.s can be a cost-effective way of introducing an area-wide speed limit reduction if multiple entrances to the same neighbourhood warrant a 40 km/h speed limit

Possible Locations for 40 km/h S.L.A.

- Elementary or secondary schools
- Universities or colleges
- Licensed childcare facilities
- City parks
- Community centres and churches
- Seniors' centres and residences
- High pedestrian traffic locations
- Locations with on-street active transportation infrastructure

Pavement Markings

Measure

Pavement markings can be used to draw attention to a specific area or information. They can also be used to create the illusion that the driver's speed is increasing.

Primary Purpose

Speed Reduction

Cost Estimate

$1,000 - $5,000

Types of Pavement Markings

- Converging Chevrons
- Dragon's Teeth
- Full-Lane Transverse Bars
- On-Road "Sign"
- Peripheral Transverse Bars
- Optical Illusion Pavement Markings *

Example of on-road "sign"

Example of dragon's teeth

Example of full-lane transverse bars

Example of converging chevron

Applicability

- **Road Classification:** Varies per pavement marking. Most can be used on all roads
- **Traffic Conditions:** All traffic volumes

Impacts

- **Environmental:** No increase in noise
- **Maintenances:** No impact to snow removal and street sweeping

Advantages

- **Speed Reduction:** Reductions in 85th percentile speed between 5 and 15 km/h **
- **Emergency response:** No impact to emergency vehicles
- **Implementation:** Can be implemented quickly

Disadvantages

- **Maintenance:** Requires regular maintenance
- **Seasonal:** Less effective in winter months due to snow/ice cover
- **Visibility:** Not as visible as other forms of traffic calming from upstream
- **Driver Response:** Impact may be reduced over time

* Should be used with caution

** Dependent on type of pavement marking used

Radar Message Board

Measure

Radar message boards can be used to alert drivers if they are speeding by displaying a message.

Primary Purpose

Speed Reduction

Cost Estimate

$3,000 - $8,000

Case Studies

Toronto

Hamilton

Example of radar speed sign

Example of radar speed sign

Applicability

- **Road Classification:** Typically installed on collector roads, may also be installed on local roads
- **Traffic Conditions:** All traffic volumes

Impacts

- **Environmental:** No increase in noise
- **Maintenances:** No impact to snow removal and street sweeping

Advantages

- **Speed Reduction:** Speed reduction between 3 km/h to 6 km/h
- **Emergency response:** No impact to emergency vehicles
- **Implementation:** Can be implemented without disruption to road network

Disadvantages

- **Usage:** When there are multiple vehicles traveling at different speeds may be difficult to make use of the radar speed sign
- **Driver Response:** Impact may be reduced over time
- **Maintenance:** Requires direct sunlight for solar panel

4.1 Warrants for Specific Measures

This section explains the warrants for three specific traffic calming measures, one for flexible bollards, one for 40 km/h speed limits, and one for Community Safety Zones (C.S.Z.). The latter two measures, which are both regulatory measures, can be used in combination with the other physical traffic calming measures to potentially enhance the effectiveness of an implemented traffic calming solution.

4.1.1 Screening Criteria for Flexible Bollards

Screening criteria recommended for the use of flexible bollards are provided in *Exhibit 4-2*. The criteria are based on “yes / no” components that determines if their use is appropriate for the studied road segment. Responses must be “yes” to all criteria for the device to be warranted. If a traffic calming device is warranted after going through the process in Section 2, this screening criteria can be used to determine if flexible bollards are an appropriate solution.

These screening criteria focus on roads where vulnerable road users are generally present, such as residential areas, school zones, and park areas. With regards to road characteristics, to mitigate road user hazards and reduce the risk of sideswipe collisions, the locations where flexible bollards are installed should avoid blocking driveways, keep clear of sharp bends and steep grades, and be limited to roads that provide one travel lane per direction. Additional flexible delineators or physical buffers may be required to avoid vehicle encroachment and preserve the intent of the bollards when installed adjacent to cycling lanes or other curbside uses (e.g., on-street parking).

Exhibit 4-2: *Screening Criteria for Flexible Bollards*

#	Screening Component	Criteria	Yes/No
1	Road Jurisdiction	Under the jurisdiction of the City of Oshawa	
2	Road Length	Sufficient length to allow flexible bollards to be placed at least 50 metres from all stop signs	
3	Road Characteristics	• Not more than two lanes wide (one lane per direction) • Placement away from driveway direct frontage possible (Example: 3 metres minimum for residential homes, distance varies for commercial, school, etc.) • Placement away from sharp turns or steep grades possible	
4	Transit / Emergency Services	Upon consultation with transit and emergency service providers (paramedic, fire, police), no significant impacts identified	
5	History	No previous N.T.M.G. assessment within the past 36 months, unless there have been significant changes to the road / area land use that are likely to impact traffic	
6	Speed*	(FOR RANKING THE DEPLOYMENT OF FLEXIBLE BOLLARDS ONLY) Observed 85th percentile speed: • 1 point for each km/h above posted speed limit	*
		Decision: Yes / No ("YES" required for ALL Items)	

** Candidate locations for deploying flexible bollards, after passing warrant criteria Items #1-5, can be ranked via Item #6, by comparing the points awarded for observed speeds at each location.*

The following *Exhibit 4-3* summarizes the recommended use and combination of flexible bollards and delineators based on road width and presence of on-street parking, as suggested by the manufacturer[4]. Individual lane widths on wide roads should be effectively reduced to 3 metres, via the installation of flexible delineators, as it is the narrower lane width that discourages higher travel speeds. Lane widths greater than 3 metres generally result in no traffic calming benefit.

4 **https://www.develotech.com/en/sign-speed-reduction/layout/**

Exhibit 4-3: *Flexible Bollard Suggested Layout*

Road Type	**Road Width (M}***	**Install Clearance**	
		Flexible Bollard	**Flexible Delineator*** (Maximum clearance between centre bollard and delineator)
Local, Collector, Arterial	6.0 m – 8.0 m	**Install at road centre**	N/A
	8.0 m – 12.0 m		3.0 m (both sides)
	9.0 m with parking lane on one side**		3.0 m (side with parking only)
	12.0 m or more		3.0 m (both sides)

** Individual lane widths, should be reduced to effectively be 3.0 metres with the installation of flexible delineators, depending on road type. The neighbourhood context and the specific varieties of vehicles on the road should be considered.*

*** Delineator installation is optional if there is high on-street parking activity.*

4.1.2 Warrant for 40 km/h Speed Limits

For collector and arterial roads in urban areas within the City, the following warrant can be used to establish the justification for 40km/h speed limits; however, professional judgment should be used when determining if 40 km/h zones are appropriate in specific locations. *Exhibit 4-4* presents the proposed 40 km/h speed limit warrant. The 40 km/h speed limit warrant is satisfied if any one of the criteria in the Warrant is satisfied. Speed limits on local roads in urban areas within the City can be set to 40km/h without satisfying the warrant; however, the warrant may be used to help prioritize which local roads get speed limit reductions first.

It is suggested that speed data be collected before and after implementation to gauge the effectiveness of speed limit reductions. Further, the installation of 40 km/h speed limit zones should be considered in conjunction with the City's deployment of future 40 km/h Speed Limit Areas.

Exhibit 4-4: *40 km/h Speed Limit Warrant*

Warrant	Criterion	Requirements
DESIGNATED AREAS OF SPECIAL CONSIDERATION	Road features, fronts, or is adjacent to any of the following: • Elementary or secondary school • Universities or colleges • Licensed childcare facility or private school • City parks • Crossing guard location • Community centre and churches • Seniors' centre and residence • Locations with on-street active transportation facility (e.g. bicycle "sharrow" on-road pavement markings) • No sidewalk **provided on** the road • A sidewalk is immediately adjacent to **traffic flow (i.e., no buffer / boulevard area)** and not separated by long-term parking (≥ 3 hours), bike lanes, or by any other form of physical buffer	At least **one** criterion is met

4.1.3 Community Safety Zone Warrant Criteria

To determine if a road segment in the City of Oshawa should be designated as a Community Safety Zone, the following warrant criteria should be considered. Both Warrant A and Warrant B, as presented in *Exhibit 4-5*, should be met to implement a C.S.Z. If there are concerns of limited citywide enforcement capacity, a C.S.Z. should only be designated at locations scoring the highest in Warrant B. Where all other eligibility requirements are met, C.S.Z. are among the designated areas were automated speed enforcement (A.S.E.) can be deployed within municipalities that are participants in the Ontario A.S.E. program.

Exhibit 4-5: *Community Safety Zone Warrant*

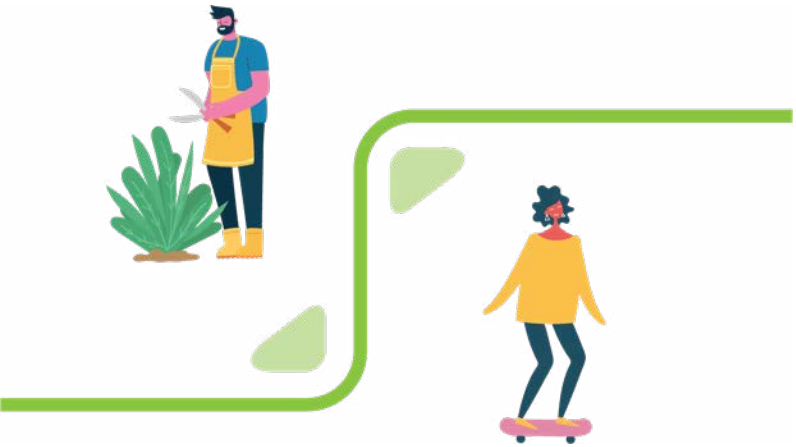
Warrant	Criterion	Requirements
WARRANT A Designated Areas of Special Consideration	C.S.Z. should only be considered at the following locations, where higher volumes of vulnerable road users are more common: • Elementary or secondary schools; • Universities or colleges; • Licensed childcare facility or private schools; • City parks; • Crossing guard locations; • Community centres and churches; • Seniors' centres and residences; and • High pedestrian traffic locations (100 pedestrians or more for any eight hours of the day).	At least **one** criterion is met
WARRANT B Safety	The safety warrant is comprised of a collision component and a risk component. C.S.Z. should only be considered if at least one component is met. **Collision Component:** Either of the criteria below must be met: • A collision ratio less than 1: 900 (collisions per year: A.A.D.T.) averaged over 36 consecutive months; or • Field observations that show that there is an unusually high violation rate (e.g., speeding, non-compliance, etc.) that is not manifested in the collision ratio. Note that if the collision ratio is greater than 1:900, other traffic calming measures should be considered. **Risk Component:** A risk factor of 16 or more must be met. Refer to *Exhibit 4-6*.	At least **one** criterion is met
WARRANT C Police Verification	C.S.Z. can only be implemented in areas where Police Services confirm that enforcement can be undertaken safely without undue risk to the motorists or officers.	Criterion must be met

Exhibit 4-6: *C.S.Z. Warrant Risk Factor Scoring Table*

Risk Factor	High (SCORE 3)	Moderate (SCORE 2)	Low (SCORE 1)	Score
Operating Speed (km/h)	60 or greater	50	40 or under	
Average Daily Volume	Over 10,000	5,000 to 10,000	Less than 5,000	
Heavy Vehicle Volume	>4%	2% to 4%	<2%	
Pedestrians Volume (in any 8 hours)	>100	50 to 100	<50	
Number of Lanes	4 or more	3	2	
Sidewalks (%)	<25% of length	25% to 75% of length	>75% of length	
On-street Active Transportation Facilities (%) *	>75% of length	25% to 75% of length	<25% of length	
Intersections and driveways per kilometre	>10	4 to 10	<4	
			Total Score	

** does not include physically separated facilities.*

5. Legislative Requirements



5.1 Ontario Highway Traffic Act (H.T.A.)

The Ontario Highway Traffic Act (H.T.A.) is legislation that outlines and governs the rules of the road, including speed limits and regulatory implications of C.S.Z. The H.T.A. outlines the ways in which municipalities can exercise control over the use of roads that are under their jurisdiction to manage traffic. The H.T.A. can be viewed online at **www.ontario.ca/laws/statute/90h08.**

The H.T.A. indicates that the speed limit on a given urban road should be 50 km/h unless otherwise indicated by by-laws. Speed limits that differ from the statutory speed limit, for example local roads posted at 40km/h, must be both signed and included in the by-law (e.g., associated schedules).

C.S.Z. are designated zones recognized in the H.T.A. The designation allows for stricter enforcement within the limits of the zone, such as the doubling of fines related to speeding.

5.2 Safer School Zone Act (Bill 65)

In May 2017, the Province of Ontario passed Bill 65, the Safer School Zone Act. The Bill includes a number of provisions that provide municipalities with greater flexibility in designing and implementing traffic control and traffic management measures. Some of the key provisions include the following:

- Allowing municipalities to designate speed limits below 50 km/h at the neighbourhood or area level (subject to 40km/h Speed Limit Area regulations); and
- Granting the ability to implement Automated Speed Enforcement (A.S.E.) in designated School Zones and C.S.Z.

The above provisions address two common criticisms of reducing posted speed limits, which are that they are costly to implement over larger areas/corridors due to the need to sign all speed limits below 50km/h within urban boundaries on a street-by-street basis, and that without significant enforcement or additional traffic calming measures, lower speed limits are relatively ineffective.

Bill 65 intends to address these two concerns by reducing implementation costs through reduced signage requirements and allowing for automated enforcement, which reduces the burden on police resources and allows for greater coverage throughout the day. The bill does not grant municipalities the permission to set statutory (unposted) speed limits within their urban boundaries at any speed other than 50km/h.

5.3 Ontario Traffic Manual

Under the H.T.A., the Ministry of Transportation published the Ontario Traffic Manual (O.T.M.). This manual provides a range of traffic control devices and systems for permanent and temporary conditions, in order to promote consistency across the province. Furthermore, the O.T.M. has a set of guidelines intended to provide road authorities the tools to update their own standards which are consistent with the H.T.A.

When implementing new traffic control or traffic calming devices, accordance with the O.T.M. should be achieved. The result of consistent application is a predictable, and thereby safer environment for drivers and pedestrians. The O.T.M. is also planned to be continuously updated with new research to ensure that Ontario is implementing best practices and matching the needs of the population.

5.4 Environmental Assessment

The Municipal Class Environmental Assessment (M.C.E.A.) manual was first prepared in 1987 by the Municipal Engineering Association and was approved under the Ontario Environmental Assessment. The M.C.E.A. manual sets out standardized planning processes for projects which fall under the municipal class, such as transportation. The 2002 N.T.M.G. relied heavily on the M.C.E.A. manual from 2000, which has since been updated on several occasions.

For instance, in the 2000 M.C.E.A. manual, the Schedule B threshold was less than $1.5 million, while the 2015 M.C.E.A. manual Schedule B threshold has increased to $9.5 million. The current M.C.E.A. (2015) has revised thresholds such that traffic calming projects generally are now exempt from the process.

- Typically, traffic calming and traffic control measures will fall under “Schedule A or A+, both regarded as “Pre-Approved,”[5] which requires that a notice of commencement be distributed, but does not require additional public consultation. The manner of public advisement is up to the municipality
- Examples of Schedule A+ projects are low-cost traffic control devices, streetscaping, sidewalk improvements, redesignation of road / one-way or two-way street conversion, adding cycling facilities, adding sidewalks - no financial limit applies; and
- Examples of Schedule A projects are the installation / construction / reconstruction of traffic control devices (e.g., signing, signalization) – applicable to projects values at under $9.5 million

Temporary measures and pilot projects do not fall within the M.C.E.A. process. Therefore, the process of implementing traffic calming measures generally now requires less consultation and has a greater focus on technical merit. This evolution in guidance provides some of the reasoning behind the Screening Checklist, Technical Warrant and Ranking Worksheet provided in Section 2.

5 **https://municipalclassea.ca/manual/page75.html**

6. Challenges and Opportunities

6.1 Enforcement Considerations

Enforcement resources must be considered when designing any neighbourhood traffic management solutions, even more so when those solutions include regulatory measures like lower speed limits and community safety zones (C.S.Z.). Establishing a C.S.Z. requires active enforcement to be effective. Traditionally, enforcement by police officers is the primary enforcement option. However, as the Safer School Zone Act was enacted, municipalities are allowed to implement Audomated Speed Enforcement (A.S.E.) in C.S.Z. to expand enforcement capacity in addition to traditional police enforcement.

A.S.E. is an automated system that uses a camera with a speed measurement device to detect and capture images of vehicles travelling faster than the posted speed limit. Images are reviewed by Provincial Offences Act officers, and then tickets are issued to the owner of the vehicle. A.S.E. systems could be placed in designated school zones or C.S.Z. to increase enforcement capacity. However, municipalities cannot unilaterally decide to implement A.S.E., participation in the Ontario A.S.E. program requires that municipalities accept common operating procedures and enter into formal agreements with the Province, the Joint Processing Centre that reviews and processes violations, and an approved system supplier.

6.2 Traffic Calming Alignment with City of Oshawa Policies

Current industry practices suggest that urban roads should be designed with a target speed that is better suited for the multi-modal context and prioritizes the safety and comfort of vulnerable road users (i.e., pedestrians and cyclists).

The City of Oshawa ***Integrated Transportation Master Plan*** (I.T.M.P.) sets goals that strive to develop a sustainable transportation system. The I.T.M.P. has a stated goal of improving mobility and emphasizes that mobility is a combination of three elements: connectivity, efficiency, and safety.

In particular, the I.T.M.P. acknowledges that efficiency and safety are often in conflict, and stresses that the safety of vulnerable road users should be the primary concern when designing transportation facilities.

The shift towards target speeds is also in alignment with the following two goals outlined in the City of Oshawa ***Active Transportation Master Plan*** (A.T.M.P.):

- Develop an active transportation system that offers a high degree of comfort and safety; and;
- Promote active transportation.

In recognition of this, the City is undergoing updates to its road design engineering standards in response to developing a more sustainable transportation network. It is the intent of this updated N.T.M.G. to be consistent with and support the goals and objectives of higher-order City planning documents, and to work in conjunction with the other standards and policies that affect the road network and all of its users to contribute to a safe and comfortable mobility experience.

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