VERTICAL DEFLECTION

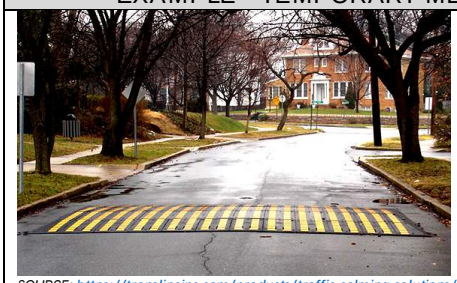
Raised Crosswalk

Description: Marked pedestrian crossing that is elevated to the sidewalk grade, to give pedestrians prominence when crossing the street.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
 *Source: https://rosehillhighways.com/products/raised-tables/*	
Potential Benefits: • Increase visibility of pedestrians and crossing • Reduction in 85th percentile speed from 5 km/h to 13 km/h • Reduction in traffic volume of up to 26% and increase of up to 7% on neighbouring streets • Increase in drivers yielding to pedestrians, 53% compared to 13% before treatment	Approximate Cost: • Capital: $8,000 to $15,000 (depending on type of finishing) • Operational Considerations: o Potential impacts to street maintenance o Potential impacts to drainage o Pavement marking and signage maintenance o Minor impact to bicycle and emergency vehicles

Speed Cushions/Speed Hump/Table

Description: Vertical structure that spans across roadway to reduce vehicle speeds.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
 *SOURCE: https://translineinc.com/products/traffic-calming-solutions/modular-rubber-products/rubber-speed-humps/#&gid=null&pid=3* 	 
Potential Benefits: • Reduction in 85th percentile speed from 6 km/h to 13 km/h • Traffic Volume reduction between 15% and 27%	Approximate Cost: • Capital: $5,000 to 8,000 • Operational Considerations: o Potential impacts to street maintenance o Pavement marking and signage maintenance

HORIZONTAL DEFLECTION & NARROWING

Traffic Circle / Traffic Button / Mini Roundabout

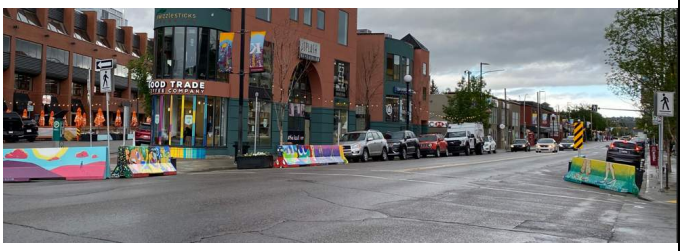
Description: Raised islands located in the centre of an intersection that channelizes traffic to move in a counterclockwise direction.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
 *Source: https://rubberform.com/product/mini-roundabouts/*	

Potential Benefits:
• Reduction in 85th percentile speed up to 14 km/h
• Reduction in traffic volumes of up to 20%
• Reduction in collision rate of approximately 30% compared to signalized intersections
• Reduction in traffic noise of 3 dBA
	Approximate Cost:
	• Capital: $25,000 to $60,000 (depends on type of finishing and landscaping)
	• Operational Considerations:
	  o Potential impacts to street maintenance
	  o Potential signage and landscaping maintenance

Curb Extension / Neckdown / Choker / Curb Bulb

Description: Narrowing of roadway either at the intersection or mid-block, to reduce vehicle speed and crossing distances for pedestrians.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
  	

Potential Benefits:
• Increase visibility of pedestrians and crossing
• Reduction in through vehicle speeds between 2 and 8 km/h
• Reduction in turning vehicle speeds
	Approximate Cost:
	• Capital: $15,000 to $50,000 per bulb (depending on impact to drainage, finishing and landscaping treatment)
	• Operational Considerations:
	  o Potential impacts to street maintenance
	  o Potential impacts to drainage
	  o Pavement marking, signage and landscaping maintenance
	  o Potential impact to parking

HORIZONTAL DEFLECTION & NARROWING

Lane Narrowing

Description: Reduction in vehicle lane width using painted lines or physical delineations to reduce vehicle speed and add space for medians, bike paths, and sidewalk.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
	 *Source: Google StreetView*
Potential Benefits: • Reduction in 85th percentile speed up to 10 km/h • Protected space for bicyclists and/or pedestrians	Approximate Cost: • Capital: $50 to $1,000 per linear meter (depending on type of treatment) • Operational Considerations: o Potential impacts to street maintenance o Pavement marking, signage and landscaping maintenance o Potential impact to parking

Raised Median Island

Description: A raised island located in the middle of the road, narrowing the roadway. This can reduce vehicle speed and can provide refuge for pedestrians crossing.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
	
Potential Benefits: • Reduction in vehicle speeds between 3 and 8 km/h • Pedestrian refuge for crossing wider roadways	Approximate Cost: • Capital: $1,500 to $2,500 per linear metre (depending on width and finishing) • Operational Considerations: o Potential impacts to street maintenance o Pavement marking, signage and landscaping maintenance o Potential impact to parking

HORIZONTAL DEFLECTION & NARROWING

Vertical Centreline Treatment

Description: Vertical flexible delineators or raised pavement markers in the centre of the roadway creating a perceived lane narrowing.

EXAMPLE

Source: City of Ottawa

Potential Benefits:

- Reduction in 85th percentile speed up to 5 km/h
- Reduction of 25% in the number of collisions per kilometre (collision density) and of 18% in the collision rate (controlled for volume)

Approximate Cost:

- Capital: $2,000
- Operational Considerations:
  - Potential impacts to street maintenance
  - Pavement marking and signage maintenance

SURFACE TREATMENT

Sidewalk Extension / Textured Crosswalk

Description: Crosswalk that has a different colour or surface texture than the roadway to indicate a pedestrian crossing.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
	
Potential Benefits: • No quantitative data available • Increase visibility of crossing, but may also be seen as a distraction for motorists	Approximate Cost: • Capital: varies • Operational Considerations: o Pavement marking maintenance o Additional lifecycle costs

Textured/Coloured Pavement

Description: Roadway pavement that has different texture or pattern than surrounding roadway to alert drivers of the potential to reduce vehicle speeds.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
	
Potential Benefits: • No quantitative data available • Increase visibility of crossings and intersection, but may also be seen as a distraction for motorists	Approximate Cost: • Capital: varies • Operational Considerations: o Pavement marking maintenance o Additional lifecycle costs o Shorter lifecycle

PAVEMENT MARKINGS

Converging Chevrons

Description: V-shaped pavement markings that are pointed in the direction of travel. The spacing of the chevrons is continually reduced to give the illusion that vehicle speed is increasing.

EXAMPLE

Source: https://www.fhwa.dot.gov/publications/research/safety/15030/009.cfm - Iowa State University

Potential Benefits:	Approximate Cost:
• Reduction in vehicle speeds between 5 and 11 km/h	• Capital: $500 per chevron • Operational Considerations: o Pavement marking maintenance

Peripheral Transverse / Full Lane Transverse Bars

Description: Series of parallel pavement markings along the edge of the travel lane (peripheral transverse) or markings that extend across the full lane (full lane transverse bars). The spacing of the markings are reduced to give the illusion that vehicle speed is increasing.

EXAMPLE

Source: https://www.fhwa.dot.gov/publications/research/safety/15030/009.cfm - Virginia Centre for Transportation Innovation and Research

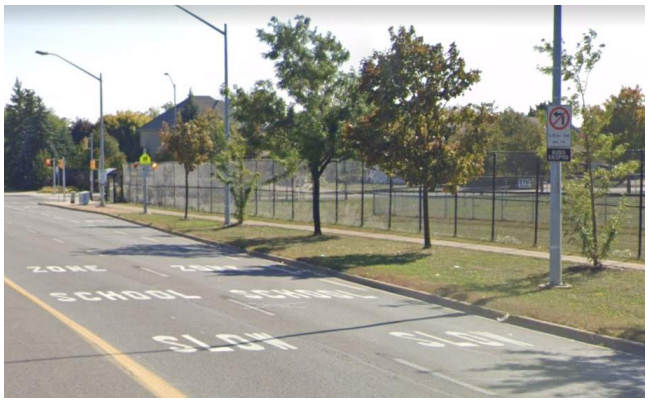
Potential Benefits:	Approximate Cost:
• Reduction in 85th percentile speed up to 8km/h (Peripheral Transverse Bars) • Reduction in 85th percentile speed between 5 and 15 km/h (Full Lane Transverse Bars)	• Capital: $40 to $150 per marking • Operational Considerations: o Pavement marking maintenance

PAVEMENT MARKINGS

On-Road 'Sign' Pavement Markings

Description: Pavement markings that provide information that is usually on signage, is painted on the roadway to provide a larger image directly in the driver's line of sight.

EXAMPLE



Potential Benefits:	Approximate Cost:
• Reduction in vehicle speeds of 6 to 14km/h	• Capital: varies • Operational Considerations: o Pavement marking maintenance

ACCESS RESTRICTION

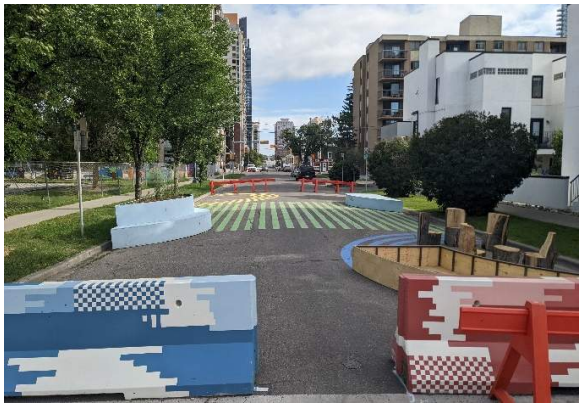
Directional Closure

Description: Curb extension or physical barrier that extends to the centreline of the roadway to prohibit one direction of traffic.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
	
Potential Benefits: • Reduction in 85th percentile speed up to 11 km/h • Reduction in vehicle volumes of 60% to 100% in the closure direction	Approximate Cost: • Capital: $20,000 to $50,000 • Operational Considerations: o Potential impacts to street maintenance o Pavement marking and signage maintenance o Potential impact to emergency vehicles

Full Closure

Description: Curb extension or physical barrier that extends to the entire length of the roadway to prohibit motor vehicle movements.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
	
Potential Benefits: • No quantitative data available	Approximate Cost: • Capital: $15,000 to $40,000 • Operational Considerations: o Potential impacts to street maintenance o Pavement marking and signage maintenance o Potential impact to emergency vehicles

ACCESS RESTRICTION

Raised Median Through Intersection

Description: An island or physical barrier located on the centerline of a two-way roadway through an intersection to prohibit left turns and through movements on intersecting roadway.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
 *Source: Google StreetView*	
Potential Benefits: • Reduction in vehicle volumes of 35%	Approximate Cost: • Capital: Varies depending on treatment type • Operational Considerations: o Potential impacts to street maintenance o Pavement marking and signage maintenance o Potential impact to emergency vehicles o Barrier maintenance and lifecycle costs

Right-in / Right-out Island

Description: Raised triangular median that prohibits left turns movements and through movements on intersecting roadway.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
 *Source: https://abaat.org/traffic/forced-turn-barriers/*	
Potential Benefits: • Reduction in vehicle volumes of 35%	Approximate Cost: • Capital: $10,000 to $25,000 • Operational Considerations: o Potential impacts to street maintenance o Pavement marking and signage maintenance o Potential impact to emergency vehicles

SUPPLEMENTAL MEASURES

Active and Safe Routes to School Program

Description: Program to establish active transport modes and safe routing for school children to get to and from school.

EXAMPLE

Potential Benefits:	Approximate Cost:

• No quantitative data available
• Increase awareness on where safe routes are and school zone areas
	• Capital: Varies
	• Operational Considerations:
	  o Coordination with school programming
	  o Potential pavement marking maintenance

SUPPLEMENTAL MEASURES

Targeted Education Campaign

Description: Event, programs, and media campaigns to raise awareness of road safety issues (ie. traffic safety, distracted driving, speeding, impaired driving, aggressive driving, share the road, etc.).

EXAMPLE

Source: ICBC.com

Potential Benefits:	Approximate Cost:

• Varies depending on campaign	• Capital: Varies
	• Operational Considerations:
	  o Potential coordination with school programming
	  o Potential coordination with ICBC and/or Ministry of Transportation

Speed Display Devices or Vehicle Activated Signs (VAS)

Description: Pole-mounted device that is equipped with radar speed detectors to display speed of approaching vehicles, or sign that displays electronic messages or warnings when activated by speeds of approaching vehicles surpassing programmed threshold.

EXAMPLE

Potential Benefits:	Approximate Cost:
• Reduction in 85th percentile speed between 3 and 14 km/h • Reduction in collision of up to 35%	• Capital: $8,000 to $15,000 • Operational Considerations: o Signage maintenance

SUPPLEMENTAL MEASURES

Shared Street

Description: Roadways that have free movement of cyclists and pedestrians, without any barriers, pavement markers, traffic signals or signs.

EXAMPLE – TEMPORARY MEASURE	EXAMPLE – PERMANENT MEASURE
 *Source: https://transforming.edmonton.ca/watch-this-space-for-developments/*	 *Source: https://banff.ca/969/Bear-Street-Shared-Street*
Potential Benefits: • Reduction in mean and 85th percentile speed up to 13 km/h[1] • Reduction of up to 49% in fatal collisions	Approximate Cost: • Capital: Varies, permanent measure can be higher costs depending on surface finishing • Operational Considerations: o Potential impacts to street maintenance o Potential impacts to drainage o Pavement marking and signage maintenance o Additional lifecycle costs

[1] *Reductions may be exaggerated due to many roads having posted speed limit reductions in combination with the shared space implementation*