School "Watch Your Speed" Program Pilot Project

Summary:

The purpose of this report is to provide the results of an evaluation of the effectiveness of permanent radar speed display signs in reducing traffic speeds in school zones, which was part of a pilot expansion of the "Watch Your Speed" Program (WYSP), conducted between November 2014 and October 2015.

These devices have shown to be effective in reducing the speed of traffic and reducing excessive speeding (over 10 km/h above the speed limit) over a long-term application. As a result, this report recommends that permanent speed display signs be considered as a countermeasure for speeding issues in school zones under the Toronto Road Safety Plan (RSP). It also sets forward a series of mandatory requirements and prioritization guidelines for assessing candidate schools should the RSP recommend deployment.

Decision History:

At its meeting of August 25, 2014, City Council directed Transportation Services to purchase, install, operate and evaluate ten (10) speed measurement and display signs on a permanent basis, as a pilot expansion of the WYSP in school zones, with the results to be reported back in the Fall of 2015.
http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2014.MM55.38

Discussion:

Background

Radar speed display signs are electronic devices composed of a radar speed detector and an LED display, which are typically attached to poles or trailers installed on the side of the road, facing oncoming traffic. They are used to measure and display the speed of oncoming vehicles as a means of affecting driving behaviour by alerting motorists of their speed. They are not a form of automated speed enforcement and thus, do not contain photographic equipment and do not result in speeding offences.

The City currently operates the WYSP, which involves the weekly re-deployment of four (4) trailer-based speed display signs to locations based on complaints and requests from the public, Councillors, Transportation Services staff, and police. As a result of growing interest, the most recent pilot expanded this program to study the effects of pole-mounted speed display signs on a permanent basis, particularly around school zones. In both cases, the objective of the program is to educate drivers and increase awareness to local speeding concerns.

Pilot Initiation

In August 2014, Transportation Services purchased ten (10) solar-powered, radar speed display signs which were installed in September and October, 2014, on approach to schools at various locations. The signs were activated on October 30, 2014 following a three week period in which pre-activation speed data was collected.

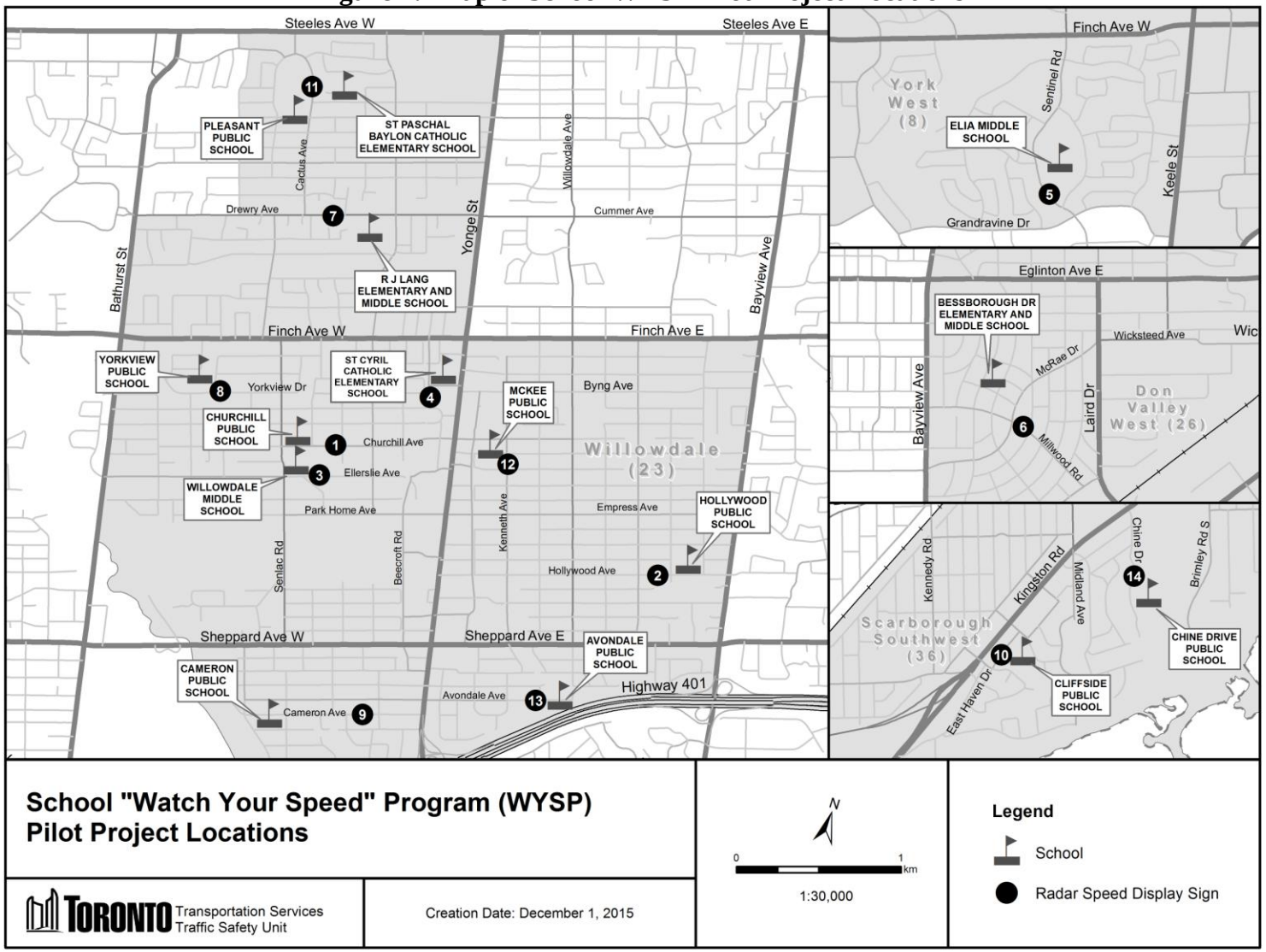
Consistent with the current WYSP, the pole-mounted signs were only operational between 7 a.m. and 9 p.m. However, unlike the WYSP trailers which operate solely on batteries that require weekly recharging, the signs operate using a solar panel that continuously recharges the batteries. As a result, the signs were allowed to operate 7 days per week. Given that the solar-powered signs have the capability of operating 24 hours a day, 7 days a week, consideration may be given to continuous operation where it is deemed necessary in future applications.

Three (3) of the schools selected for the pilot were located in Wards 8, 26 and 36, close to the site of a fatal pedestrian collision event involving school-age pedestrians travelling to or from school. The remaining schools were all located in Ward 23. Mid-way through the pilot, four (4) signs were relocated to new school locations to meet initial interest from the schools to participate in the pilot. Three (3) of the relocated sites were selected because of scheduled road resurfacing operations which would have interrupted normal traffic operations. One (1) additional site was selected based on low traffic speeds. In total, the signs were installed and operated at 14 school locations for periods ranging from 2 months to 11 months. The locations and schools involved in the pilot are depicted in Figure 1 on the following page and listed in Table 1 below. The posted speed limit at all locations was 40 km/h.

Table 1: Pilot Locations

No.	Street Name	Duration Of Pilot (Mon.)	School
1	Churchill Ave.	11	Churchill Public School
3	Hollywood Ave.	11	Hollywood Public School
5	Ellerslie Ave.	11	Willowdale Middle School
7	Beecroft Rd.	11	St. Cyril Catholic School
8	Sentinel Rd.	11	Elia Middle School
9	Millwood Rd.	11	Bessborough Drive Elementary and Middle School
2	Drewry Ave.	4	R.J. Lang Elementary and Middle School
4	Yorkview Dr.	4	Yorkview Public School
6	Cameron Ave.	2	Cameron Public School
10	East Haven Dr.	4	Cliffside Public School
11	Cactus Ave.	6	St. Paschal Baylon Catholic School and Pleasant Avenue Public School
12	Kenneth Ave.	6	McKee Public School
13	Avondale Ave.	6	Avondale Public School
14	Chine Dr.	6	Chine Drive Public School

Figure 1: Map of School WYSP Pilot Project Locations



Effectiveness Evaluation

Staff collected and monitored speed data at each location throughout the course of the pilot to compare speeds pre-activation and post-activation. The metrics compared were operating speed, volume over the speed limit and volume greater than 10 km/h over the speed limit. The results of the analysis are summarized in Table 2 on the following page and illustrated in Figure 2.

Pre-activation speed data was collected at each location over a three (3) week period with the LED display turned off and without a reflective "Your Speed" sign border. Upon activation, the LED display was switched on and the sign border was mounted.

At locations where the pilot operated for more than 4 months, the results showed a reduction in operating speeds, volume of traffic travelling over the speed limit and volume of traffic travelling more than 10 km/h over the speed limit. These effects were consistent at all locations and over a long-term basis.

Key findings after 11 months of operation include:

- Decrease in operating speeds, ranging from 1 km/h to 9 km/h;
- Decrease in the number of vehicles travelling over the speed limit, ranging from 2.6% to 33.8%;
- Decrease in the number of vehicles speeding excessively (greater than 10 km/h over the speed limit), ranging from 0.5% to 18.1%;
- Increase in the number of vehicles travelling near the speed limit;
- Speed reduction effects were more pronounced at locations with higher initial operating speeds.

The four (4) locations with the highest operating speeds were selected for an evaluation of the impact of police enforcement on the effectiveness of the signs. Police enforced speed limits over a three (3) month period at two (2) locations and speed data was compared with two (2) locations where police enforcement was withheld over the same period. As shown in Attachment B, there were similar long-term speed reduction effects on the operating speed and volume of traffic over the speed limit at both sets of locations, indicating that police enforcement did not result in any additional benefit.

Table 2: School WYSP Pilot Project Before/After Analysis – Summary of Findings
(Speed and % volume data averaged over 3 mid-week days from 7 a.m. – 9 p.m.)

Location	Posted Speed Limit (km/h)	Operating (85th Percentile) Speed (km/h)				% Volume > Speed Limit				% Volume > 10 km/h > Speed Limit			
		Before	1 Month	6 Months	11 Months	Before	1 Month	6 Months	11 Months	Before	1 Month	6 Months	11 Months
Churchill Ave *	40	51	47 (-4)	46 (-5)	47 (-4)	72.2	56.8 (-15.4)	53.5 (-18.7)	53.7 (-18.5)	22.4	10.8 (-11.6)	8.4 (-14)	8.9 (-13.5)
Beecroft Rd *	40	57	54 (-3)	53 (-4)	53 (-4)	82.3	74.6 (-7.7)	73.8 (-8.5)	72.8 (-9.5)	44.8	30.8 (-14.0)	28.2 (-16.6)	27.5 (-17.3)
Hollywood Ave	40	47	45 (-2)	45 (-2)	45 (-2)	53.1	47.2 (-5.9)	42.3 (-10.8)	42.6 (-10.5)	10.9	5.9 (-5.0)	5.8 (-5.1)	6.6 (-4.3)
Ellerslie Ave	40	51	47 (-4)	47 (-4)	42 (-9)	60.7	57.2 (-3.5)	59.9 (-0.8)	26.9 (-33.8)	21.4	11.4 (-10.0)	12.0 (-9.4)	3.3 (-18.1)
Sentinel Rd	40	47	46 (-1)	45 (-2)	46 (-1)	56.3	53.9 (-2.4)	49.5 (-6.8)	53.7 (-2.6)	8.7	8.2 (-0.5)	6.7 (-2.0)	8.2 (-0.5)
Millwood Rd	40	47	44 (-3)	44 (-3)	44 (-3)	50.8	36.6 (-14.2)	38.6 (-12.2)	37.9 (-12.9)	8.1	3.6 (-4.5)	4.4 (-3.7)	3.9 (-4.2)
Avondale Ave **	40	45	42 (-3)	40 (-5)	N/A	42.1	30.2 (-11.9)	21.9 (-20.2)	N/A	5.7	2.0 (-3.7)	3.3 (-2.4)	N/A
Kenneth Ave **	40	45	43 (-2)	42 (-3)	N/A	39.0	30.3 (-8.7)	24.8 (-14.2)	N/A	4.6	2.7 (-1.9)	2.8 (-1.8)	N/A
Cactus Ave **	40	51	50 (-1)	45 (-6)	N/A	81.6	71.6 (-10.0)	45.1 (-36.5)	N/A	26.6	19.0 (-7.6)	8.0 (-18.6)	N/A
Chine Dr **	40	39	39 (0)	34 (-5)	N/A	16.5	13.9 (-2.6)	3.0 (-13.5)	N/A	1.0	1.0 (0)	0.1 (-0.9)	N/A
Drewry Ave ***	40	52	51 (-1)	N/A	N/A	86.2	82.0 (-4.2)	N/A	N/A	27.4	23.5 (-3.9)	N/A	N/A
East Haven Dr ****	40	23	22 (-1)	N/A	N/A	1.3	0.2 (-1.1)	N/A	N/A	0.9	0.1 (-0.8)	N/A	N/A
Yorkview Dr ****	40	41	44 (3)	N/A	N/A	22.4	38.5 (16.1)	N/A	N/A	2.6	5.7 (3.1)	N/A	N/A
Cameron Ave ****	40	38	38 (0)	N/A	N/A	12.9	11.3 (-1.6)	N/A	N/A	0.4	0.4 (0)	N/A	N/A

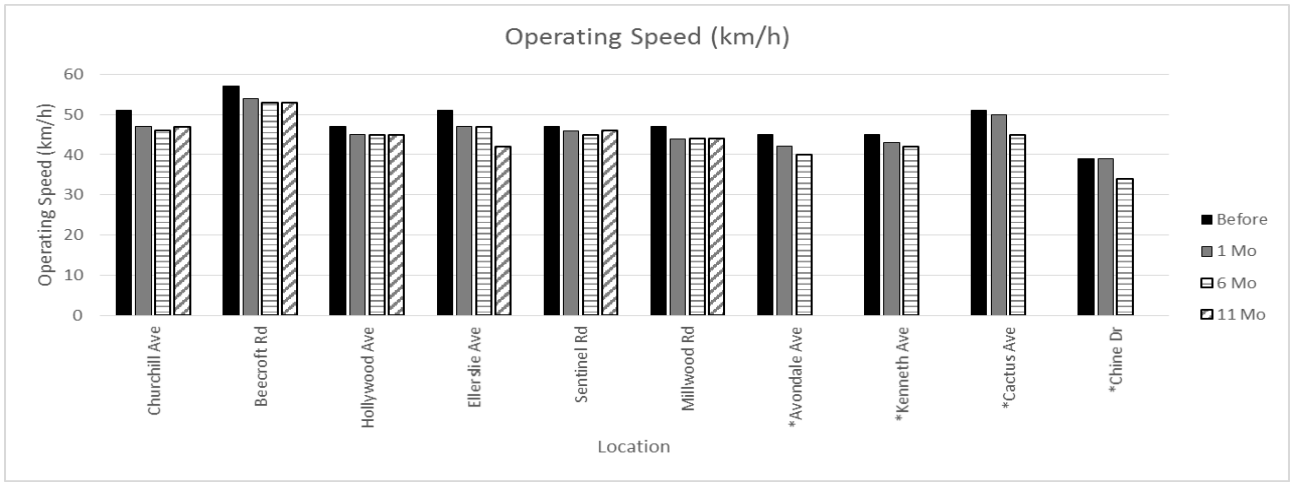
Table 2 Notes

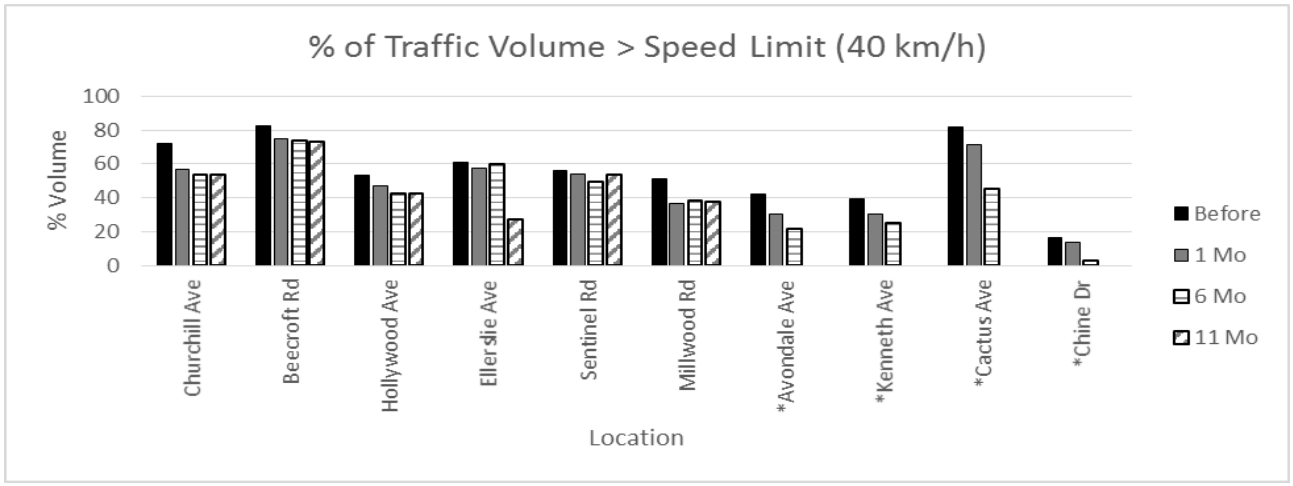
() Difference from "before" period
* Police enforcement during 6 months "after" period
** Phase 2 of pilot (installed March 2015)
*** Removed due to scheduled maintenance
**** Phase 1 of pilot (removed March 2015)

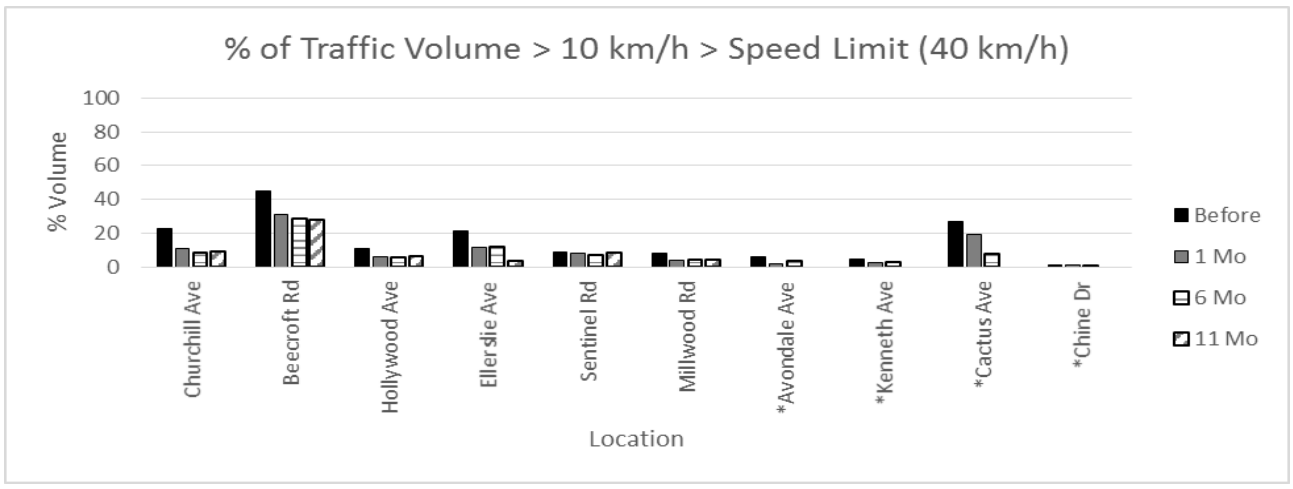
Definitions

Operating (85th Percentile) Speed – The speed at or below which 85% of vehicles are observed travelling.

Figure 2: School WYSP Pilot Project Before/After Analysis Summary Charts







Costs

The resources and costs required to purchase, install, evaluate and operate the signs for one year as part of the pilot are summarized in Table 3 below. The costs are exclusive of taxes and separated into capital and operating costs. Capital costs include one-time cost for supply of each radar speed display sign. Operating costs include both the one-time cost for installation of each sign and the annual costs for on-going monitoring, maintenance and troubleshooting.

Table 3: Pilot Costs

Capital Costs			
Description	Cost Per Sign	Qty.	Extended
One-Time Costs			
Supply of 1 Radar Speed Display Sign	$4,915.50	10	$49,155.00
Total:	**$4,915.50**	10	**$49,155.00**
Operating Costs			
One-Time Costs			
Staff Effort (including on-site inspection, programming and supervision)	$927.74	10	$9,277.40
Contracted Services (including installation)	$1,133.23	10	$11,332.30
Total:	**$2,060.97**	10	**$20,609.70**
Annual Costs			
Contracted Services (including troubleshooting)	$264.79	10	$2,647.90
Staff Effort (including monitoring, monthly inspections, troubleshooting and analysis)	$1,459.33	10	$14,593.30
Remote Sign and Data Management Service	$360.00	10	$3,600.00
Total:	**$2,084.12**	10	**$20,841.20**
Grand Total:	**$9,060.59**	10	**$90,605.90**

Based on the pilot program, the estimated cost to expand the WYSP to include permanent speed display signs is outlined in Table 4. The costs are divided into five scenarios depending on the number of signs purchased, taking into account discounts given for bulk purchases and economies of scale regarding staffing requirements.

It is assumed that one FTE is required for the management of up to 500 signs, based on current staffing levels for similar traffic device contracts. Considering previous experience with WYSP trailers and similar permanent technology on City roads, the estimated life expectancy of the signs is approximately 10 years.

The costs are comprised of a capital cost attributed to the supply and installation of the signs and an annual operating cost, which includes troubleshooting, routine inspections/maintenance, programming and general administration. Excluded from the cost summary is the annual operating cost for the online remote sign and data management service, which was only included for the pilot for the purpose of evaluating effectiveness.

There are approximately 850 schools (elementary and high school) in the Toronto District School Board and Toronto Catholic District School Board combined. Given that there are 44 Wards and assuming that 2 signs are installed at each school, there could potentially be an average of 40 signs installed per Ward.

Table 4: Expanded Program Cost (Estimated life expectancy of 10 years):

Scenario 1: 10 Signs			
Description	Cost Per Sign	Qty.	Total
Capital Cost (Supply and Install)	$6,100	10	$61,000
Annual Operating Cost	$800	10	$8,000
Grand Total:	**$6,900**	**10**	**$69,000**
Scenario 2: 100 Signs			
Description	Cost Per Sign	Qty.	Total
Capital Cost (Supply and Install)	$5,400	100	$540,000
Annual Operating Cost (Includes 0.2 FTE)	$800	100	$8,000
Grand Total:	**$6,200**	**100**	**$620,000**
Scenario 3: 250 Signs			
Description	Cost Per Sign	Qty.	Total
Capital Cost (Supply and Install)	$5,200	250	$1,300,000
Annual Operating Cost (Includes 0.5 FTE)	$900	250	$225,000
Grand Total:	**$6,100**	**250**	**$1,525,000**
Scenario 4: 500 Signs			
Description	Cost Per Sign	Qty.	Total
Capital Cost (Supply and Install)	$5,200	500	$2,600,000
Annual Operating Cost (Includes 1 FTE)	$900	500	$450,000
Grand Total:	**$6,100**	**500**	**$3,050,000**
Scenario 5: 1000 Signs			
Description	Cost Per Sign	Qty.	Total
Capital Cost (Supply and Install)	$5,200	1000	$5,200,000
Annual Operating Cost (Includes 2 FTE)	$900	1000	$900,000
Grand Total:	**$6,100**	**1000**	**$6,100,000**

Guidelines for Future Installations

Based on the results of the pilot evaluation, speed display signs should be considered as a potential countermeasure for addressing speeding issues. However, similar to traffic calming measures and other traffic control devices, individual potential installation locations should be reviewed and assessed based on technical criteria to determine suitability and to ensure effectiveness. As with other traffic control devices, the proliferation and inappropriate use of these signs could potentially reduce compliance and diminish their effectiveness.

This pilot focused on safety and speeding issues around schools, as children are among the most vulnerable road users in the road network. As a result, the use of these signs should be limited to roadways in front of schools in order to ensure that drivers make a strong association with these signs and the need to reduce speeds near schools.

With these criteria in mind, staff propose a set of mandatory requirements which schools must satisfy in order for permanent speed display signs to be installed. These include the following:

- **School must be on a local or collector road, or on an arterial road with 2 or more KSI collisions –** Consistent with the City's current traffic calming policy, use of these signs should be limited to local and collector roads only, which primarily serve residential communities. However, consideration will also be given to schools on arterial roads where 2 or more KSI collisions have occurred within the last 5 years.

- **Operating speed of road must be minimum 10 km/h over the speed limit** – Also consistent with the current traffic calming policy, signs should only be used on roads with a confirmed speeding issue. Each road fronting an entrance to the school should be assessed for operating speed.

Recognizing that there may be great interest and demand for these signs, but that resources may be limited, staff also propose a point scoring system for prioritizing schools which meet the mandatory requirements to ensure that signs are first installed where they are most effective and the needs are greatest. Considerations include the conditions shown below in Table 5.

Table 5: School WYSP Prioritization Conditions

Condition	Motivation
1. Elementary school	Younger children still learning rules of the road and basic safety skills are at greater risk than older students.
2. Active transportation or school safety related initiative or program	Safety in school zones should be a shared responsibility and engineering measures, such as traffic calming and traffic control devices, should be considered one component in a multi-faceted strategy for addressing safety concerns around schools. Elementary schools that make an effort to help ease traffic conditions and improve safety will be given greater consideration.
3. Fronting onto a street with higher traffic volumes.	Safety risk for pedestrians is generally higher on streets with higher traffic volumes.
4. Abuts or is located within 200m of a park or community centre.	Parks and community centres close to schools result in additional school-age pedestrian traffic.
5. Fronting onto a street where there is no sidewalk or has sidewalk on one side only.	Safety risk for pedestrians is generally higher on streets without physical separation between traffic and pedestrians.

The installation of signs should be limited to a maximum of one sign in each direction of traffic and only on roads fronting school entrances used for student pick-up and drop-off activity, where the mandatory operating speed requirement is satisfied. A proposed form to assess and prioritize candidate schools is shown on the following page.

Form 1: School WYSP Mandatory Requirements and Prioritization Guidelines

School: _____

Address: _____

District: _____

Request Initiated by: _____

Date Requested: _____

1. Mandatory Requirements – School must satisfy BOTH of the following requirements to be considered.

Requirement	Description	Requirement Met?
1.0 Road classification	School is located on a local or collector road, or on an arterial road with 2 or more KSI collisions.	☐
1.1 85th percentile speed	School is located on a road with an 85th percentile speed at least 10 km/h above the speed limit.	☐

2. Prioritization Guidelines – Greater consideration will be given to schools with higher scores.

Guideline	Description	Point System	Score
2.0 Elementary school	Priority will be given to elementary schools (grades K-6, K-8, 7-8).	Elementary school = 4 pts High school = 2 pts	
2.1 Active transportation or related school safety initiative	School is involved in one of the following active transportation or school safety related initiative or program: ☐ Active & Safe Routes to School ☐ Walk-A-Block ☐ Walking Wednesdays ☐ Walking School Bus ☐ Walking Buddies ☐ Parent Safety Program ☐ Other: _____	4 pts	
2.2. 24 hour traffic volume	Priority will be given to schools located on a street with higher traffic volumes.	1 pt for every 2,000 vehicles per day	
2.3 Proximity to park or community centre	School abuts a park or community centre, or is within 200m of a park or community centre.	Abuts = 4 pts Within 200m = 2 pts	
2.4 Sidewalks	School is located on a street with no sidewalk or a sidewalk on one side only.	No sidewalk = 4 pts One sidewalk = 2 pts	
		Total Score:	

Financial Impacts:

There are both Capital and Operating costs associated with the proposed expansion of the WYSP to add permanent speed display signs in school zones, including purchase, installation, operation and maintenance costs. Annual costs will vary depending on the number of signs installed. The estimated annual capital and operating cost is approximately $69,000 to install 10 signs, $620,000 for 100 signs, $1,525,000 for 250 signs, $3,050,000 for 500 signs and $6,100,000 to install 1000 signs. Annual operating costs include one full-time equivalent (FTE), which based on current staffing levels for similar traffic device contracts, is required for the management of up to 500 signs.

Currently, the WYSP operates with no dedicated budget and staff. Therefore, additional Capital and Operating funds would be required for an expanded program. Once Council approves the specific plan, additional budget funding and staff complement would be identified and submitted for consideration during the annual budget process.

The Deputy City Manager and Chief Financial Officer has reviewed this report and agrees with the financial impact information.

Conclusions:

- The Division has conducted and completed its review of a pilot expansion of the WYSP in school zones. The results showed that the use of radar speed display signs can be an effective, long-term strategy for reducing operating speeds and excessive speeding (greater than 10 km/h over the speed limit).

- Assuming expansion of the WYSP, it would be anticipated that the total capital and annual operating costs would be approximately $69,000 to install 10 signs, $620,000 for 100 signs, $1,525,000 for 250 signs, $3,050,000 for 500 signs and $6,100,000 to install 1000 signs. Annual operating costs include one FTE which is required for the management of up to 500 signs (based on current staffing levels for similar traffic device contracts).

- Staff recommends that the WYSP be expanded under the RSP to include permanent speed display signs as one of the countermeasures for addressing safety in school zones and that a set of mandatory requirements and prioritization guidelines be adopted for assessing candidate schools.

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