



**The Tire Stops Here**

Pavement Friction  
Management to Reduce  
Accidents and Avoid  
Litigation

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President

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# Presentation Overview

- Canadian Roadway Friction “Policy”
- Vision Zero & Safe Systems Approach
- Federal Highway Administration
  - Continuous Pavement Friction Measurement
  - Minimum Investigatory Levels
- Municipal Context
- Surface Restoration Alternatives
- Summary & Questions

# Canadian Roadway Friction & Texture “Policy”

- “We don’t want to know” / “We’ll get sued”
- “Human factors and speeding cause accidents”
- “No test equipment available”
- “No established thresholds”



# “Vision Zero” & Safe Systems Approach

- “Vision Zero” acknowledges that even a single roadway death is too much
- Safe Systems Approach (SSA) recognizes:
  - Humans make mistakes; and
  - Mistakes should not automatically lead to injury or death.
- SSA should design and manage roadway infrastructure to:
  - Anticipate mistakes & keep the risk of a mistake low; and
  - Reduce the impact of crashes such that the human(s) are not seriously injured or killed.



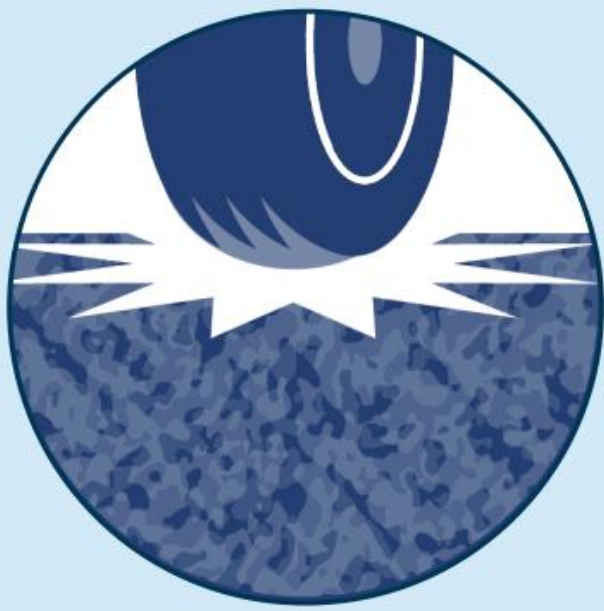
# MAKING OUR ROADS SAFER

One  
Countermeasure  
at a Time

*28 Proven Safety Countermeasures that offer significant and measurable impacts to improving safety*

- 28 strategies in 5 categories:
  1. Speed Management
  2. Pedestrian/Cyclist
  3. Roadway Departure
  4. Intersections
  5. Crosscutting





**Safety Benefits:**  
HFST can reduce  
crashes up to:

**63%**

for injury crashes at ramps.<sup>2</sup>

**48%**

for injury crashes at  
horizontal curves.<sup>2</sup>

**20%**

for total crashes at  
intersections.<sup>3</sup>

## Pavement Friction Management

- Continuous Pavement Friction Measurement (CPFM)
  - Sampling at 100mm allows complete evaluation of roadway
- Measure, Monitor & Maintain
  - Prevent roadway departures, pedestrian & intersection crashes
- Various surface treatments available to address low friction/texture

# FHWA SA-23-006

- 1) Developed Crash Modification Factors/Functions (CMFs/CMFx) to evaluate the effect of changes in friction on safety (and cost effectiveness of treatments); and
  - 2) Established Investigatory Thresholds for friction based on road type and category
- Strong statistical association between friction and macrotexture & crash rates
  - Reduction of up to 30% in total crashes with increase of 10 SFN40

## CHARACTERIZING ROAD SAFETY PERFORMANCE USING PAVEMENT FRICTION

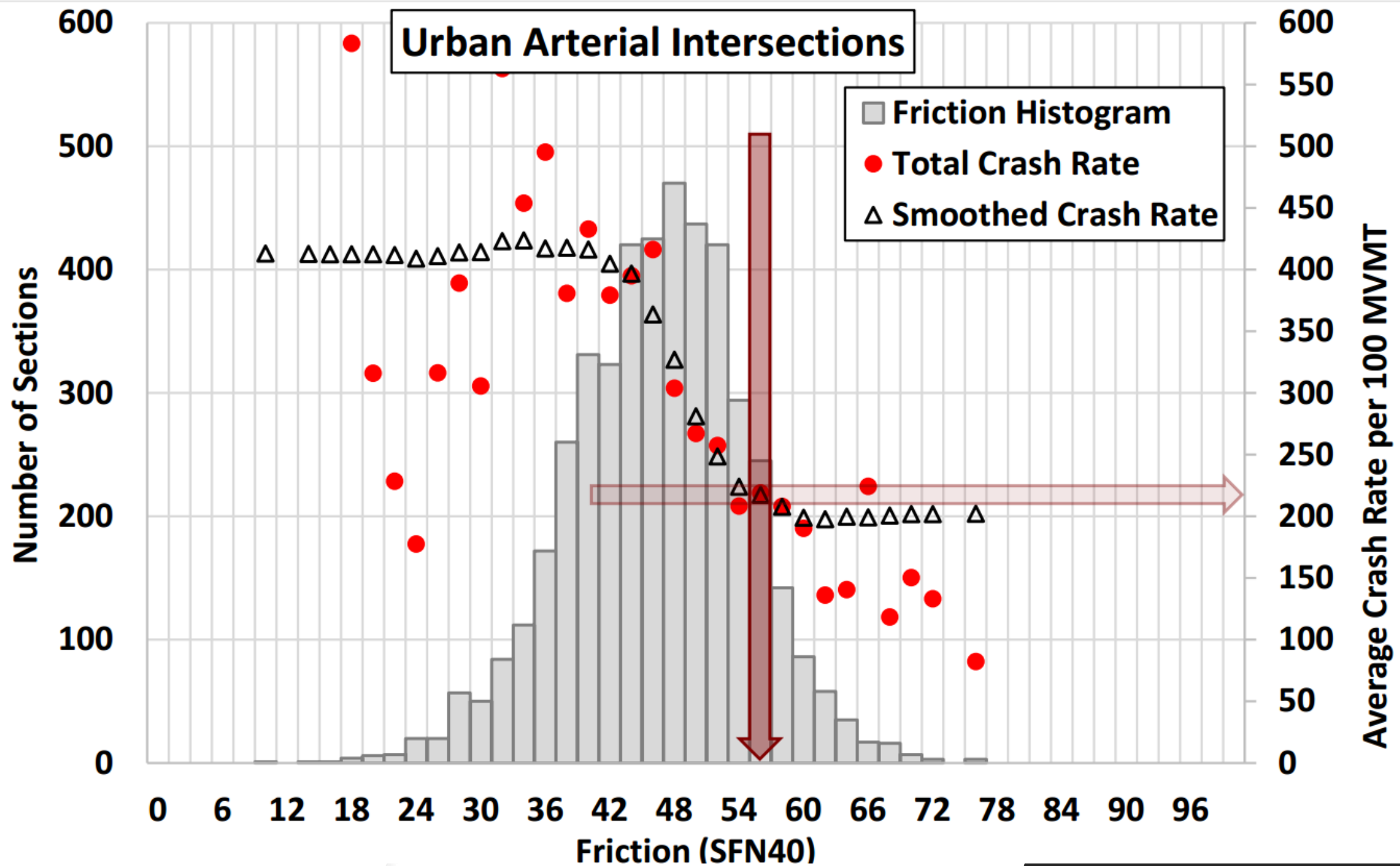
PUBLICATION NO. FHWA SA-23-006



U.S. Department of Transportation  
Federal Highway Administration

**ZERO** IS OUR GOAL  
A SAFE SYSTEM IS HOW WE GET THERE





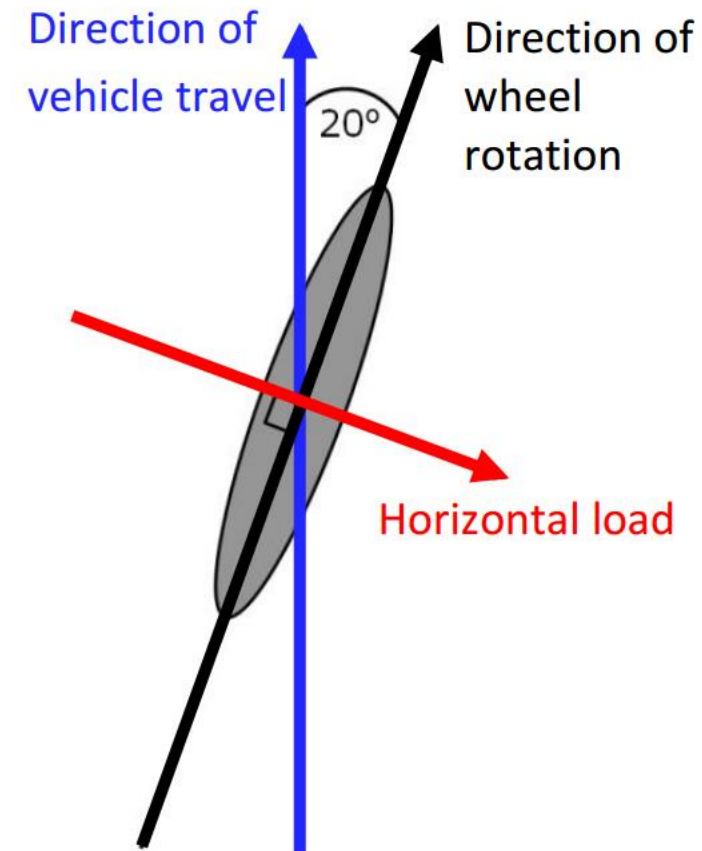
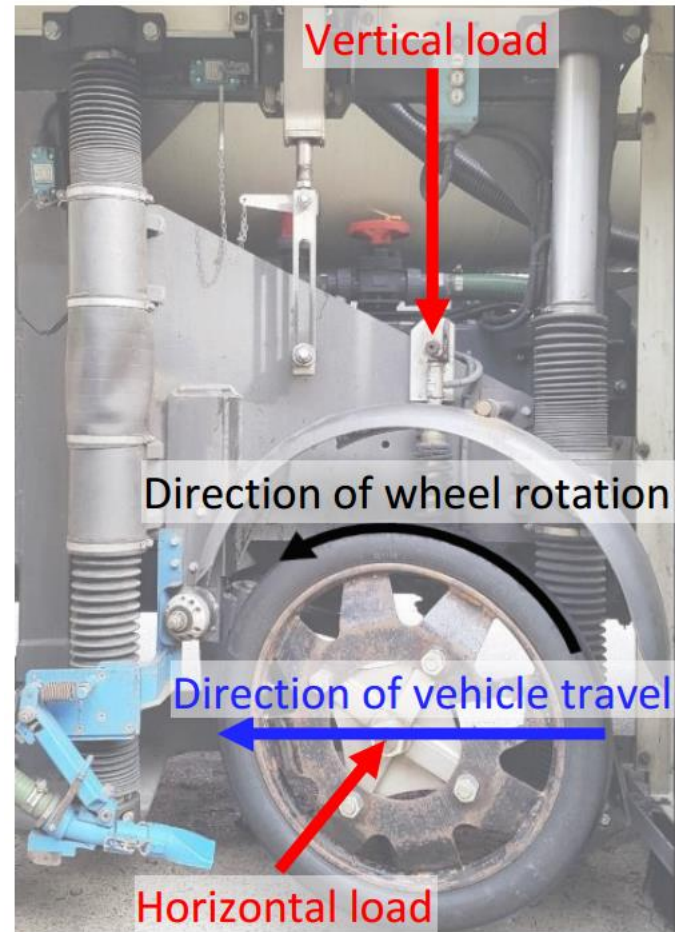
**Table 13. Summary of the threshold analysis**

<b>Roadway Facility Type</b>	<b>Site Type</b>	<b>Suggested</b>	<b>Graphic Threshold</b>	<b>Approximate UK CSC Eq.</b>	<b>CS 228 ST</b>	<b>CS 228 LR</b>
<b>Freeways</b>	Tangents	40	36 – 38	0.29 - 0.31	0.35	0.30
	Curves	45	42 – 44	0.34 - 0.36	0.45 - 0.50	
	Ramp Access	45	44 – 46	0.36 - 0.37		
<b>Rural Multilane Roadways</b>	Divided Tangents	50	48 – 50	0.39 - 0.41	0.35 - 0.40	0.30
	Undivided Tangents	50	48 – 50	0.39 - 0.41	0.40 - 0.45	0.35
	Curves	55	54 – 56	0.44 - 0.46	0.45 - 0.50	
	Intersections	55	54 - 56	0.44 - 0.46	0.45 - 0.55	0.40
<b>Rural 2-lane, 2-way Roadways</b>	Tangents	50	48 - 50	0.39 - 0.41	0.40 - 0.45	0.35
	Curves	55	54 - 56	0.44 - 0.46	0.50- 0.55	0.45
	Intersections	60	54 - 56	0.44 - 0.46	0.45 - 0.55	0.40
<b>Urban and Suburban Arterials</b>	Divided Tangents	50	48 - 50	0.39 - 0.41		
	Undivided Tangents	50	48 - 50	0.39 - 0.41		
	Curves	50	48 - 50	0.39 - 0.41		
	Intersections	55	54 - 56	0.44 - 0.46		

# What is SFN40?

- Sideway Force Number @ 40 mph ( $\approx 64$  kph)
- Continuous friction measurement with SCRIM (Sideways-force Routine Investigation Machine)
  - Freely rotating measurement wheel at 20 degrees
  - Water spray
  - Collected at posted speed & corrected to 40 mph

$$\text{Side-Force Coefficient} = 100 * \text{Horizontal Load} / \text{Vertical Load}$$





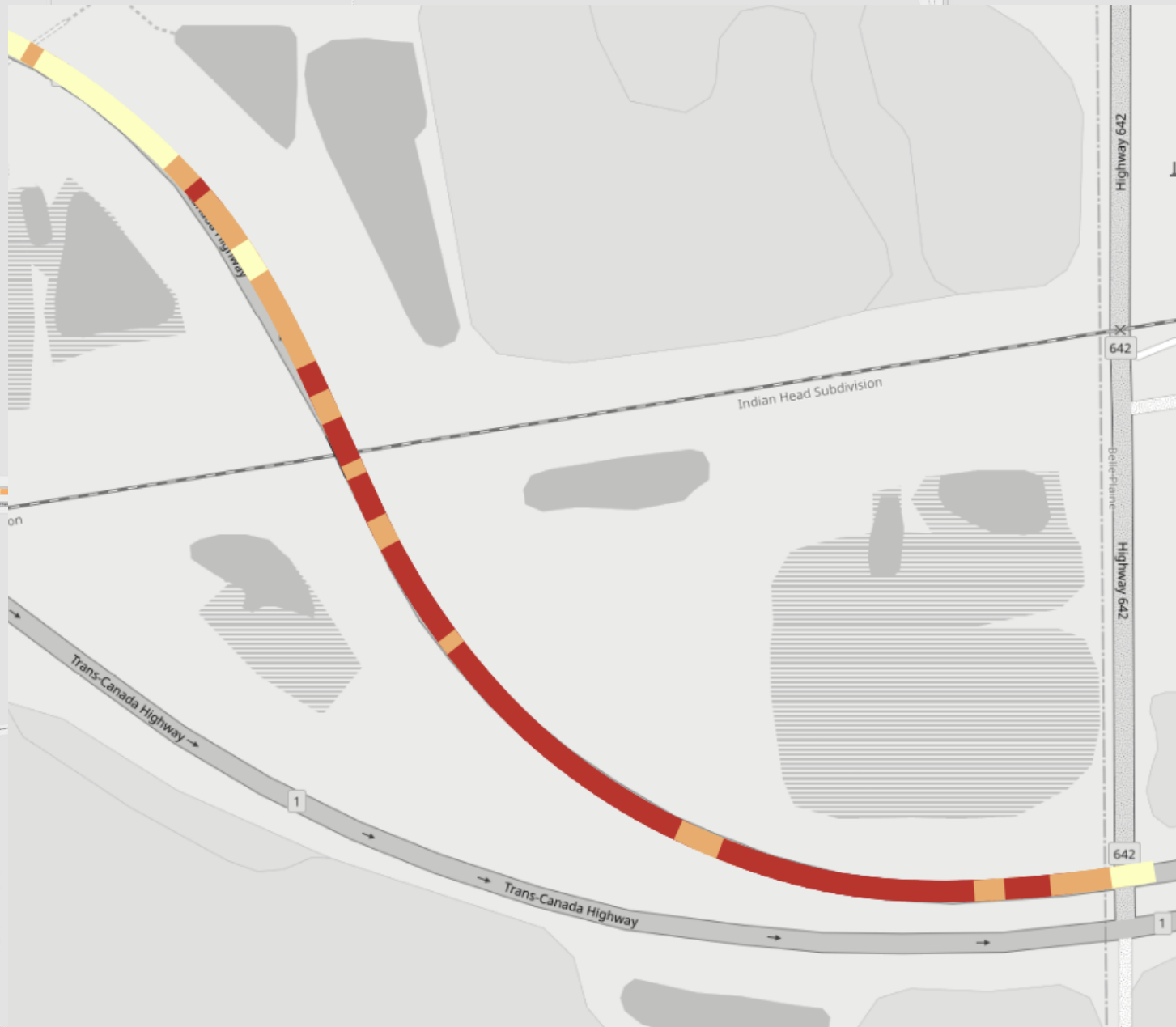
Network Level Testing

### WDM SCRIM Delivery

SCRIM Reading

- 26 - 36
- 36 - 46
- 46 - 56
- 56 - 66
- 66 - 76

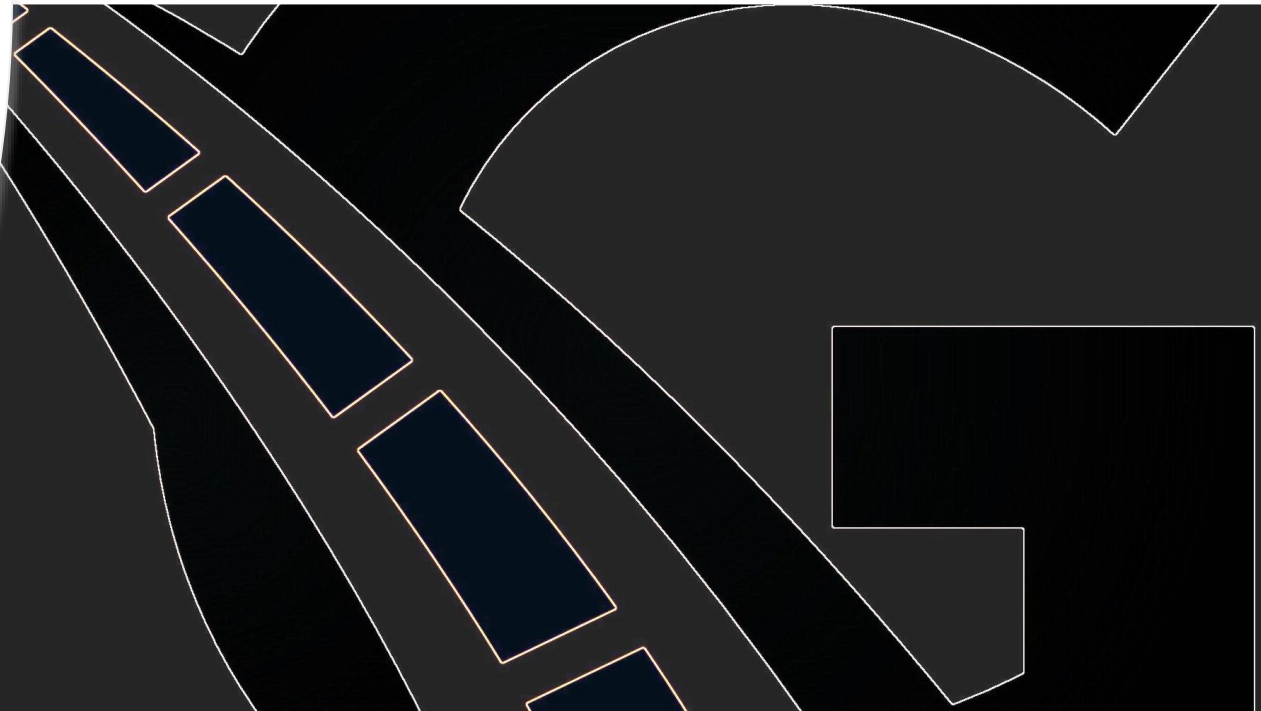
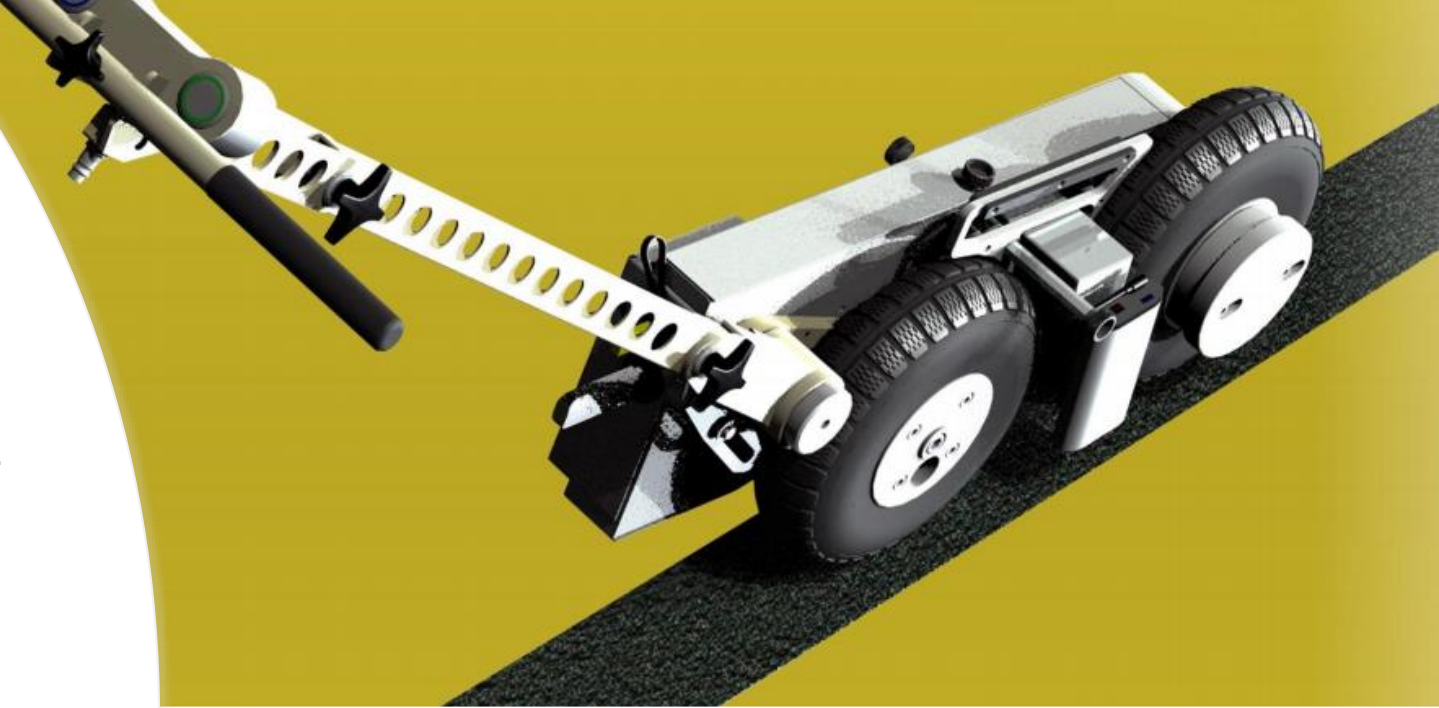
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# Project Level Testing



- T2Go Continuous Friction Device
- Fixed Slip of 20 degrees
- Walking speed with readings @ 30mm intervals
- Water backpack
- Integral GPS, Temp & Humidity
- Phone interface
- Road markings, crosswalks, pathways, intersections, indoors



- RHVP & Linc = 19 km urban freeway in Hamilton, ON
  - Opened in 2007 – immediate concerns re. markings, lighting & slipperiness
  - Seven (7) deaths btw 2012 & 2018
- RHVP Inquiry initiated in 2019
  - 2 volumes = 1,000 pages
  - “Friction” occurs 1,418 times in Volume 1 & 860 times in Volume 2
  - “relatively low friction levels a likely contributor to collisions”
  - “low friction levels made the roadway less forgiving to driver speed and error”
  - “geometric features contributed to increased friction demand”

**Report of the  
Red Hill Valley  
Parkway Inquiry**


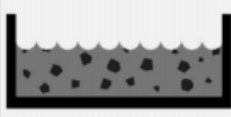
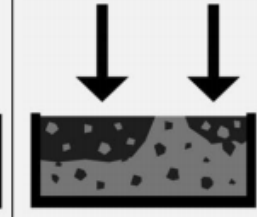
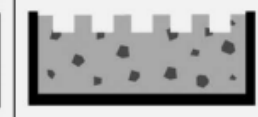
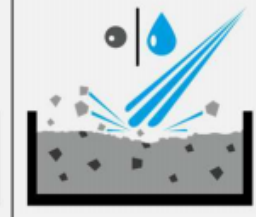
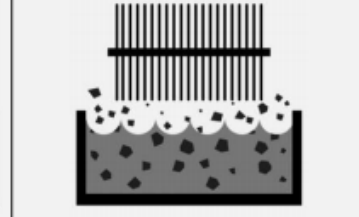
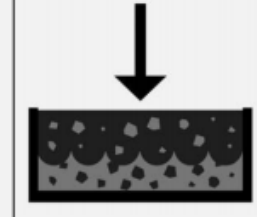
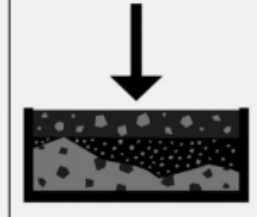
The Honourable Mr. Justice  
Herman J. Wilton-Siegel  
Commissioner

- 1) Traffic safety is a shared responsibility between City departments
- 2) Adopt a comprehensive safety approach (MTO-style)
- 3) Develop a culture of collaboration and cooperation between departments
- 4) Enable information sharing between departments
- 5) Better and more consistent reporting to Council
- 6) Address issue re. consultant engagements & staff reports

**We now  
have  
Investigatory  
Levels!!!**



# Surface Restoration

		Urgent Interventions				Planned Interventions		
Panneau de Temporary Corrective Signage correctifs*		Micro Milling	Mechanized Patching	Diamond Grinding	Shot-blasting / Hydro-blasting	Wet Sweeping (1), Mechanical Broom (2), or Absorbant (3)	Milling and Overlay	Padding and Overlay
								
Bleeding	D-310-1 ou D-310-2							
Wear & Polishing								
Rutting and Deformation								
Crack Sealing	D-310-2						Cas extrême	
Debris (solids)	T-190					1 ou 2		
Debris (oils, etc.)	D-310-1 ou D-310-2					2 ou 3		
Excess Tack Coat						1 ou 2		
Inconsistent Texture								

# Summary and Key Takeaways

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- Cannot continue to keep our heads in the sand with respect to friction
  - Agencies adopting Vision Zero and SSA policies
  - FHWA & RHVP Inquiry have opened the door for litigation – be proactive!!!
- Continuous friction measurement is the only approach to measure, monitor & maintain adequate friction
  - Network & Project level measurement options
- Once low friction is identified, numerous options are available for restoration

# Questions?

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