NGWBS Tires on Canadian Highways

Theoretical Perception and Practical Observations

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Agenda

- **Review of 2013 presentation**
  - Benefits
  - Challenges
- **The 3 Key Questions**
  - Limitations of the pavement studies
  - Expected NGWBS tire's uptake rate and truck weight trends across Canada
  - Regional truck traffic trends
- **What does all this mean?**
- **WSP Economic Impact study preview – Alberta**
- **Conclusion**
- **Open discussions**

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Review - Benefits

PRODUCTION
Savings of 9 gallons of oil per tire

If 14% of the trucks sold in 2013 converted to NGWBS, each province will see a reduction in post usage tire to be processed by 20.5K – 145K kilograms

END-OF-LIFE PROCESSING

With just 14% uptake, the trucks sold in 2013 with NGWBS will save the industry $573K - $4.0M in fuel per province which can be better spent on training, equipment upgrades and growth.

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Review - Concerns

Grellet, Doré, Bilodeau and Gauliard

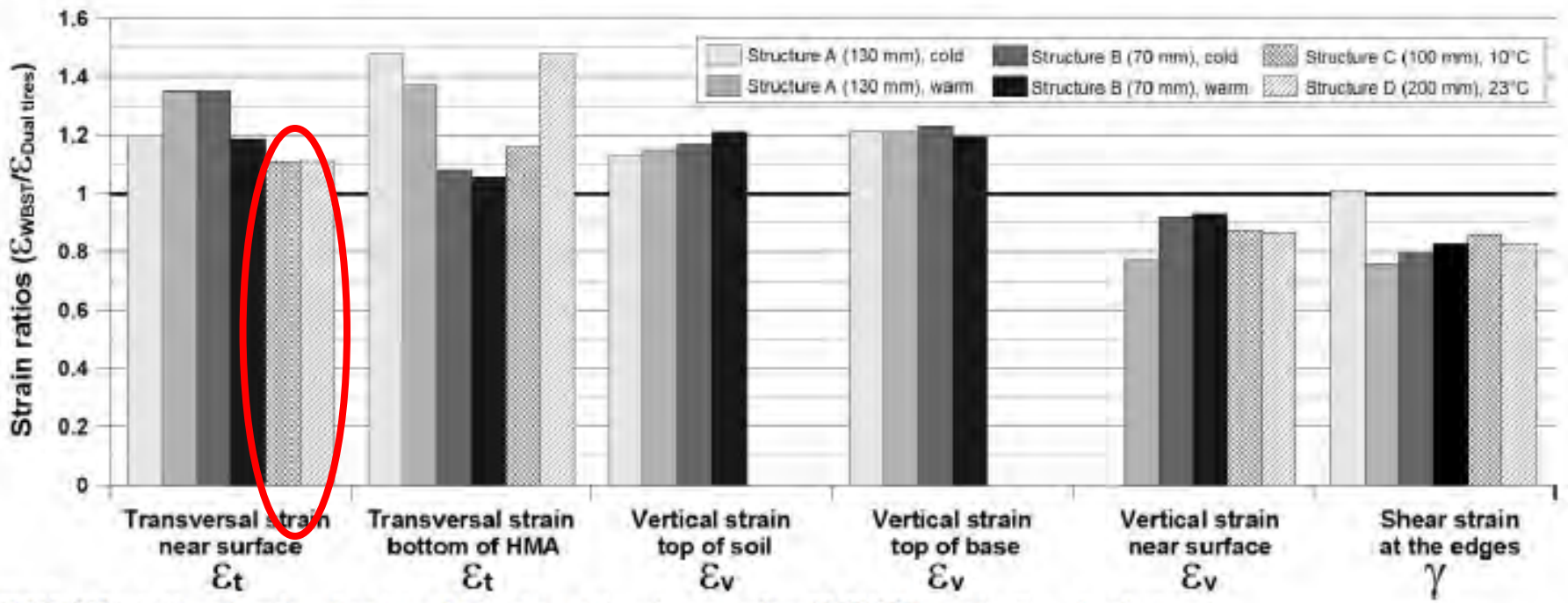

FIGURE 4 Synthesis of critical strain ratios (strain for WBST/strain for dual tires).

Only tests on structures C and D are representative as it compares 11R22.5 against the 455/55R22.5

"Comparison between wide based single tire and dual tires assembly based on experimental pavement response and predicted damage" ***Damien Grellet, Guy Dore, Jean-Pascal Bilodeau, Thomas Gauliard***

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Question 1

There are a variety of tire brands and types. However, most studies are done with just Michelin tires.

What is the impact of tire type and usage condition on the tire's footprint?

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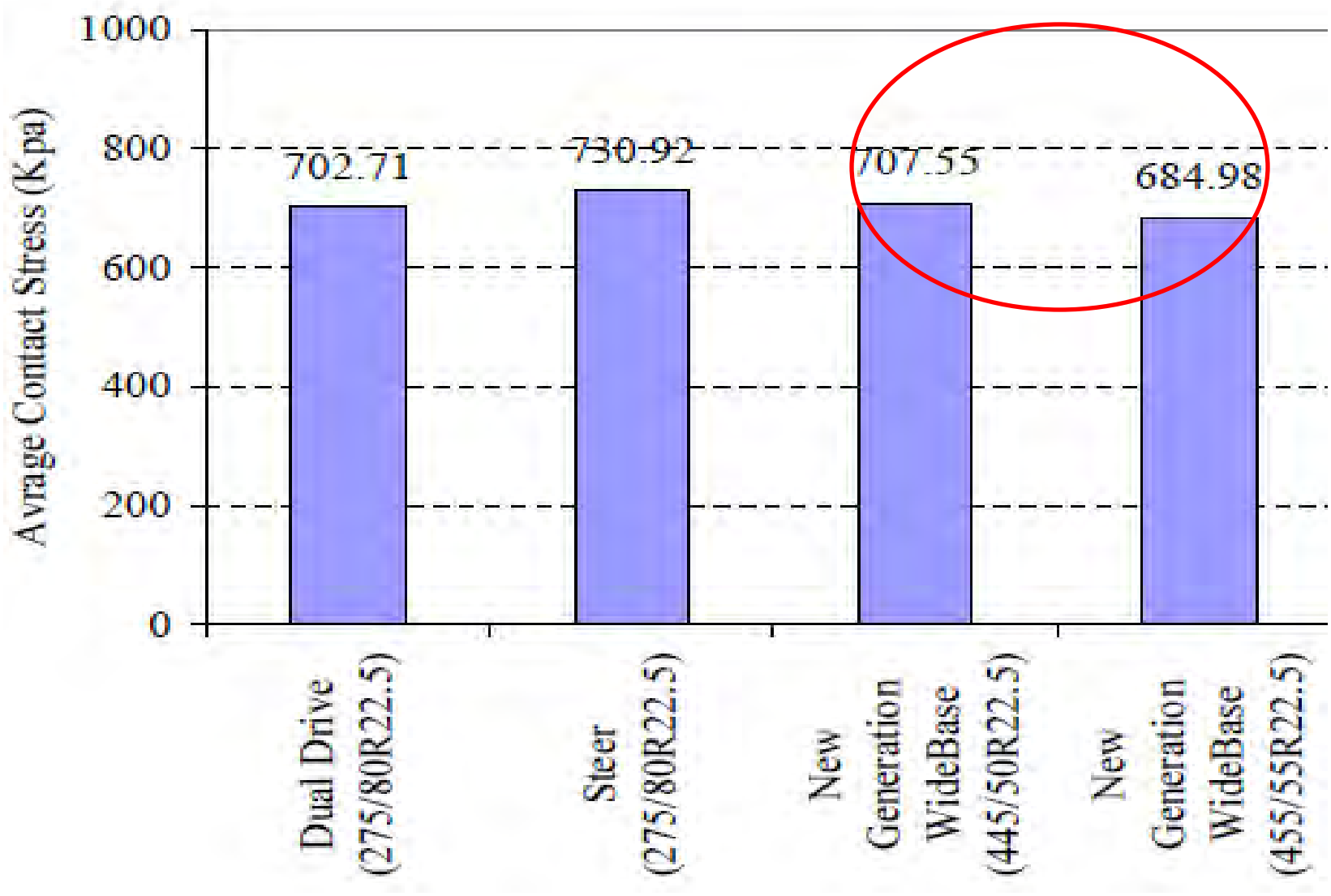

Footprint Analysis

Impact of load/Pressure

27% difference in TCA

Description	Position	Load (KG)	Press (KPA)	TSA (SQMM)	CSR %	TCA (SQMM)	LSW (MM)
Tire A	TRAILER	1900	690	37839	0.733	27749	301.43
Tire A	TRAILER	2800	760	46632	0.757	35278	307.80

Impact of 1st life vs. Retread coupled with different tread

Description	Position	Load (KG)	Press (KPA)	TSA (SQMM)	CSR %	TCA (SQMM)	LSW (MM)
Tire A	TRAILER	1900	690	37839	0.733	27749	301.43
Tire B Retread 220mm	DRIVE	1900	690	38306	0.611	23407	298.9

Tire A has 19% more TCA

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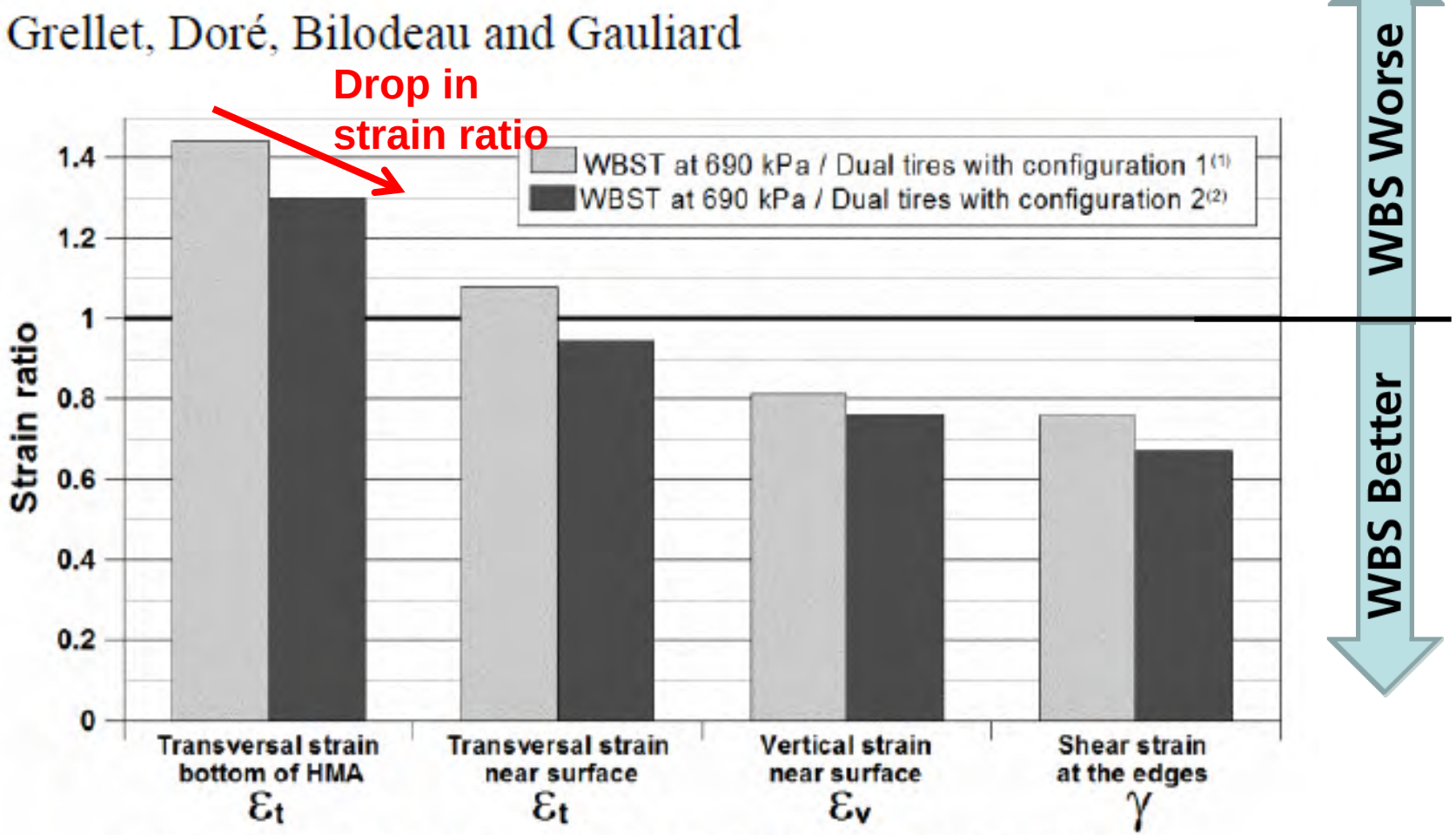
Dual Unequal Inflation Impact

Grellet, Doré, Bilodeau and Gauliard



(1)Configuration 1: Dual tires with tire #1 at 690 kPa and tire #2 at 690 kPa

(2)Configuration 2: Dual tires with tire #1 at 690 kPa and tire #2 at 550 kPa

FIGURE 8 Synthesis of critical strain ratios for structure D at 23°C with differential tire pressure

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Summary of findings

The wide variety of dual tire brands, types and usage conditions show significant differences in contact area.

There are several studies on NGWBS vs. Dual tires but and almost all tend to focus on just a select set of tires.

None of the past studies address this spectrum of tire types.

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Question 2

Studies suggest that NGWBS may have different impact depending on the roads fatigue mode

Real life impact will be dependent on:

a. Estimated uptake rates

b. Truck weights and loading distribution

Can we quantify these parameters?

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Average axle weight distribution across Canada

The data below is the % of non-steer axles that were above the US load and were running on Canadian highways. Data based on WIM data, Govt. data, Trucking Assoc. provided data as well as Michelin CES field survey data

WHY???

NB 18/9% (8,000)

BC 17%

AB 18/13% (143)

SK* 23/21% (315)
SK** 25/13% (222)

MB 26/12% (410)

ON/QC 25/22% (252)

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Uptake in the US

- **The US is a mature market for NGWBS**
- **Michelin CES roadside survey in 2013 suggests 19% uptake rate amongst long haul fleets**
- **2013 RMA tire sales data suggests that approximately 14% of the long haul wheel positions in the trucks with 11R and 295/75R22.5 wheel are on NGWBS in the US.**

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Summary of findings

Conservative estimates from our research suggest that at any given time, less than 25% of the trucks on the road are running greater than the US load (7700kg/axle).

Data from the Weigh in Motion Scales (WIMS) suggest this number is under 20%.

The uptake rate of NGWBS is expected to be 14% of long haul (less than that if we consider NGWBS as a percentage of all non-steer tires).

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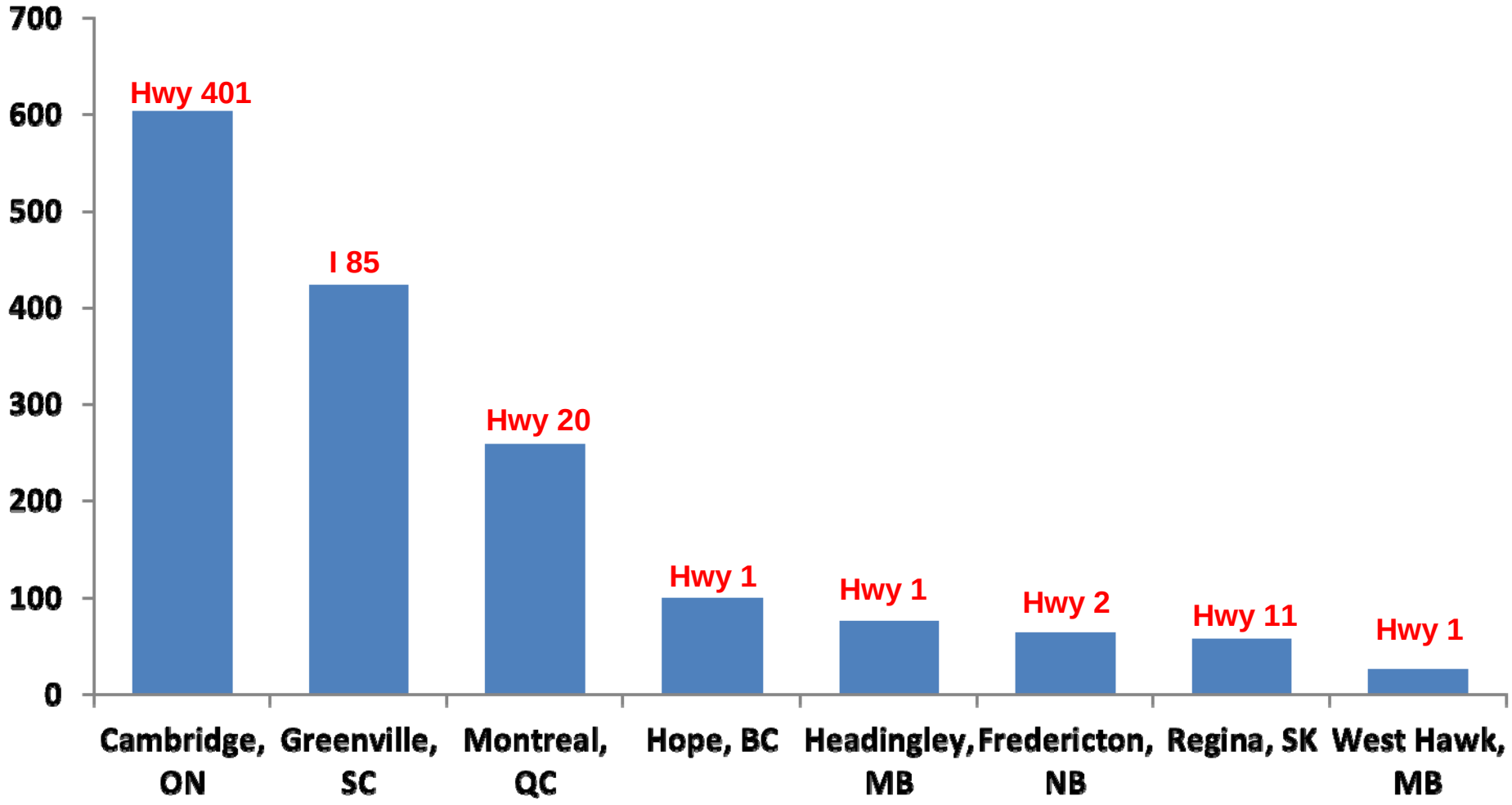
Question 3

What does truck traffic look like in the various regions?

What does truck traffic look like in the various regions? (Trucks/hr/direction)



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What does all this mean?

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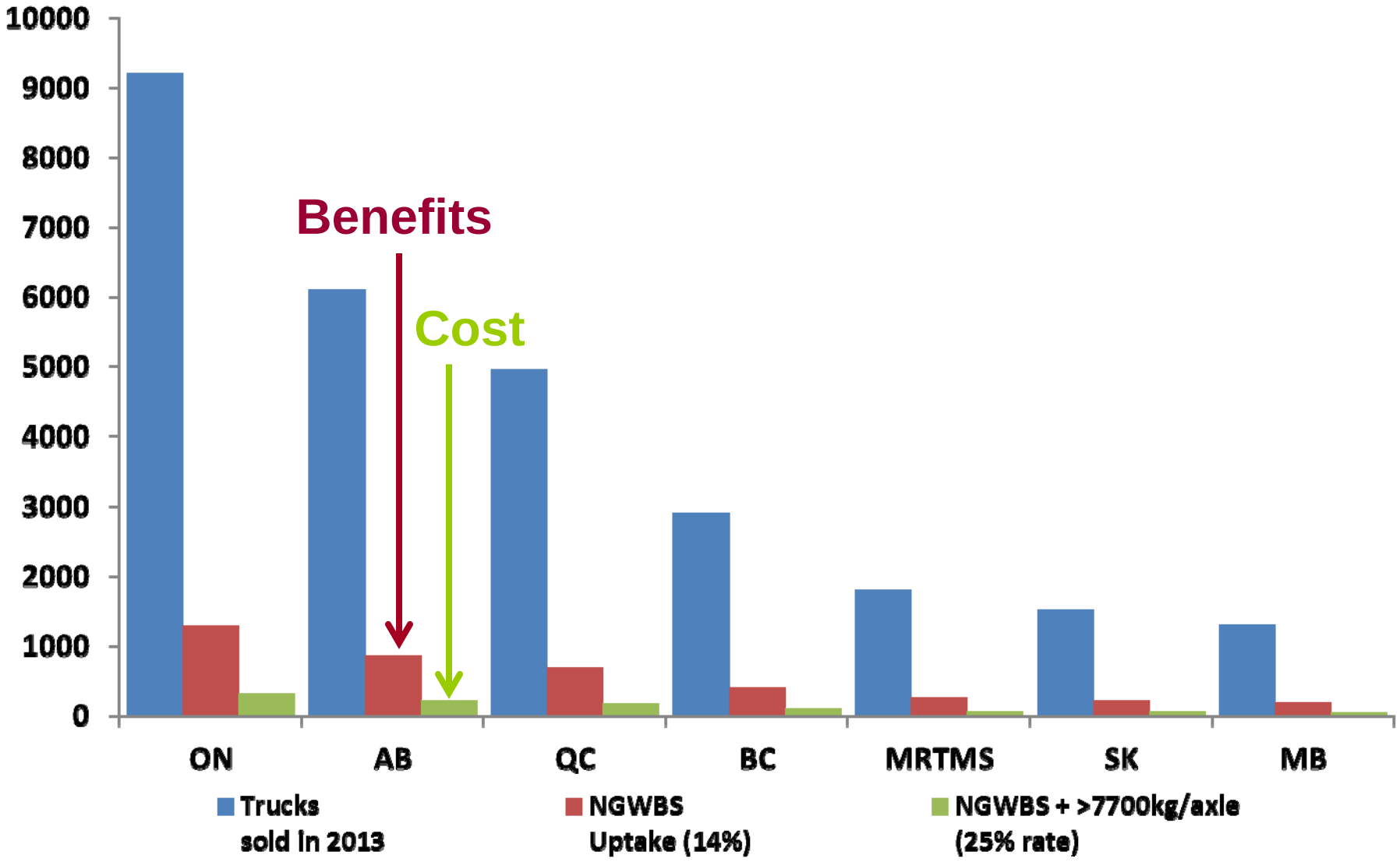
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Benefits
Cost
ON
AB
QC
BC
MRTMS
SK
MB
Trucks sold in 2013
NGWBS Uptake (14%)
NGWBS + >7700kg/axle (25% rate)

Preview from WSP

New Generation Wide Based Single Tires

(Cost-Benefit Analysis)

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Predicted damage to road network

Damage/M VKM	2 axles	3 axles	4 axles	5 axles	6 axles	7 axles	8 axles or +	TOTAL
MVKM 2013 Total	32,37	42,50	584,91	764,46	841,74	199,69	563,40	3029,08
14% adoption rate	4,53	5,95	81,89	107,02	117,84	27,96	78,88	424,07
Percentage of vehicle operating 7 700 and the maximum weight allowed	0,03%	6,7%	1,0%	10,5%	8,4%	23,3%	21,3%	
14 % adoption rate and over 7700 (MVKM)	0,00	0,40	0,84	11,24	9,86	6,53	16,81	
Damage $/km 2014	0,00	0,00	0,00	0,00	0,02	0,03	0,05	
Total damage (M$)	**0,0**	**0,00**	**0,00**	**0,04**	**0,15**	**0,16**	**0,82**	**1,18**

"New Generation Wide Based Single Tires – Cost-Benefit Analysis" WSP

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Conclusion

- **8500kg/axle (or 9100kg/axle) allowance on a tandem configuration is very important for Canadian operations**
- **The research papers to date have several limitations.**
- **Translating the results of research papers to real world application without other pertinent factors significantly overestimates the impact of NGWBS on the Canadian roads.**
- **Expected change in scenario compared to current:**
  - Benefit = 14% * number of trucks
  - Cost = 14% * 25% * Number of trucks
- **For every 100 trucks entering the market**
  - 14 are expected to convert to NGWBS
  - 3.5 are expected to convert to NGWBS and be above the US load

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Canadian fleets need the flexibility to be able to run on NGWBS with full Canadian load (8500kg/axle or 9100kg/axle on tandem)

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Thank you for your attention

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