# Technical Issues: Measurements and Highway standards.

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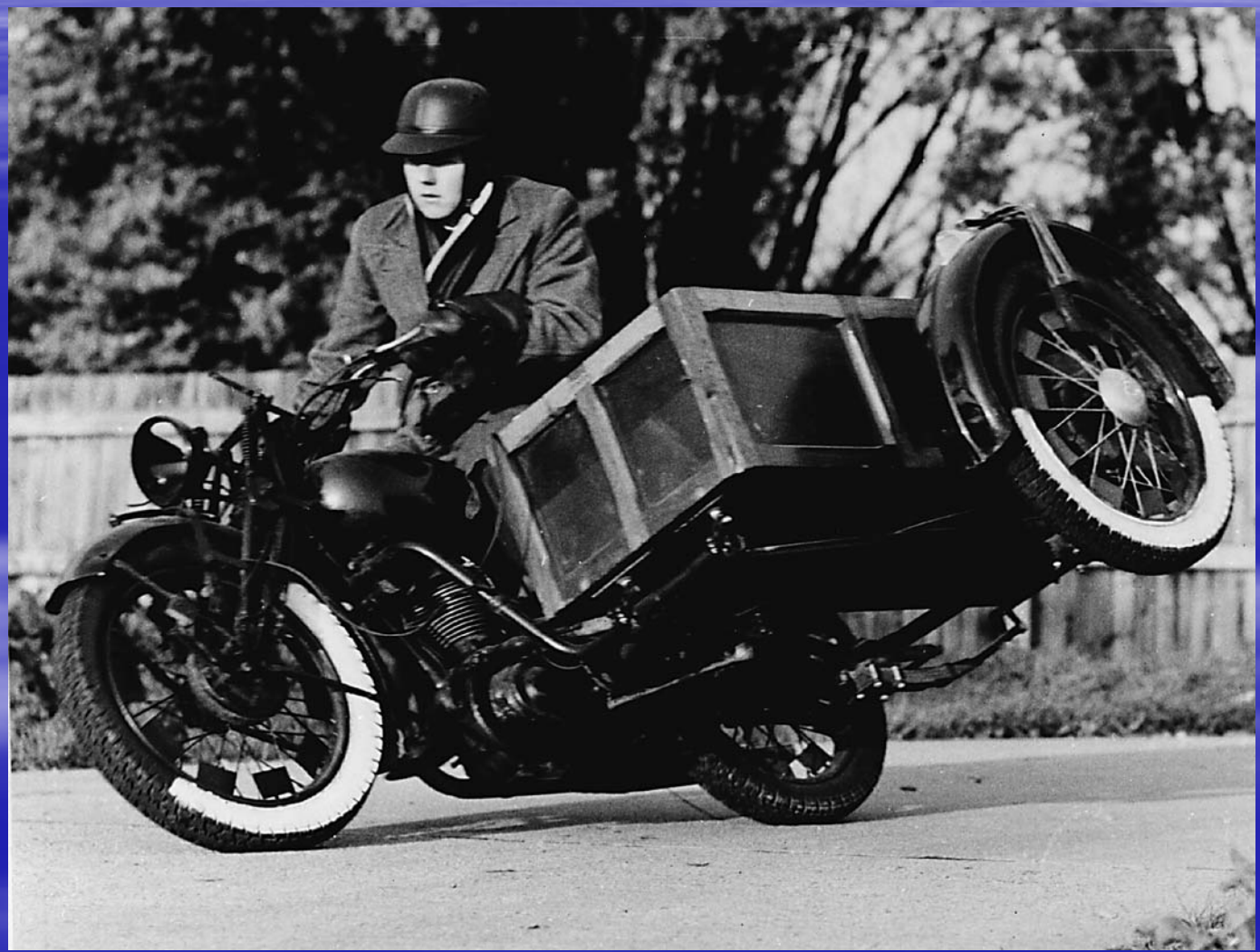
# Structure of this presentation.

- Describe the problem of wet road skid resistance;
- Explain the role of micro and macro texture;
- Define equilibrium skid resistance or ultimate state of polishing;
- Consider what standards should be included in a policy;
- Describe the main methods of measuring wet road skidding resistance.
- Discuss the factors that influence wet road skidding resistance and choosing treatments.

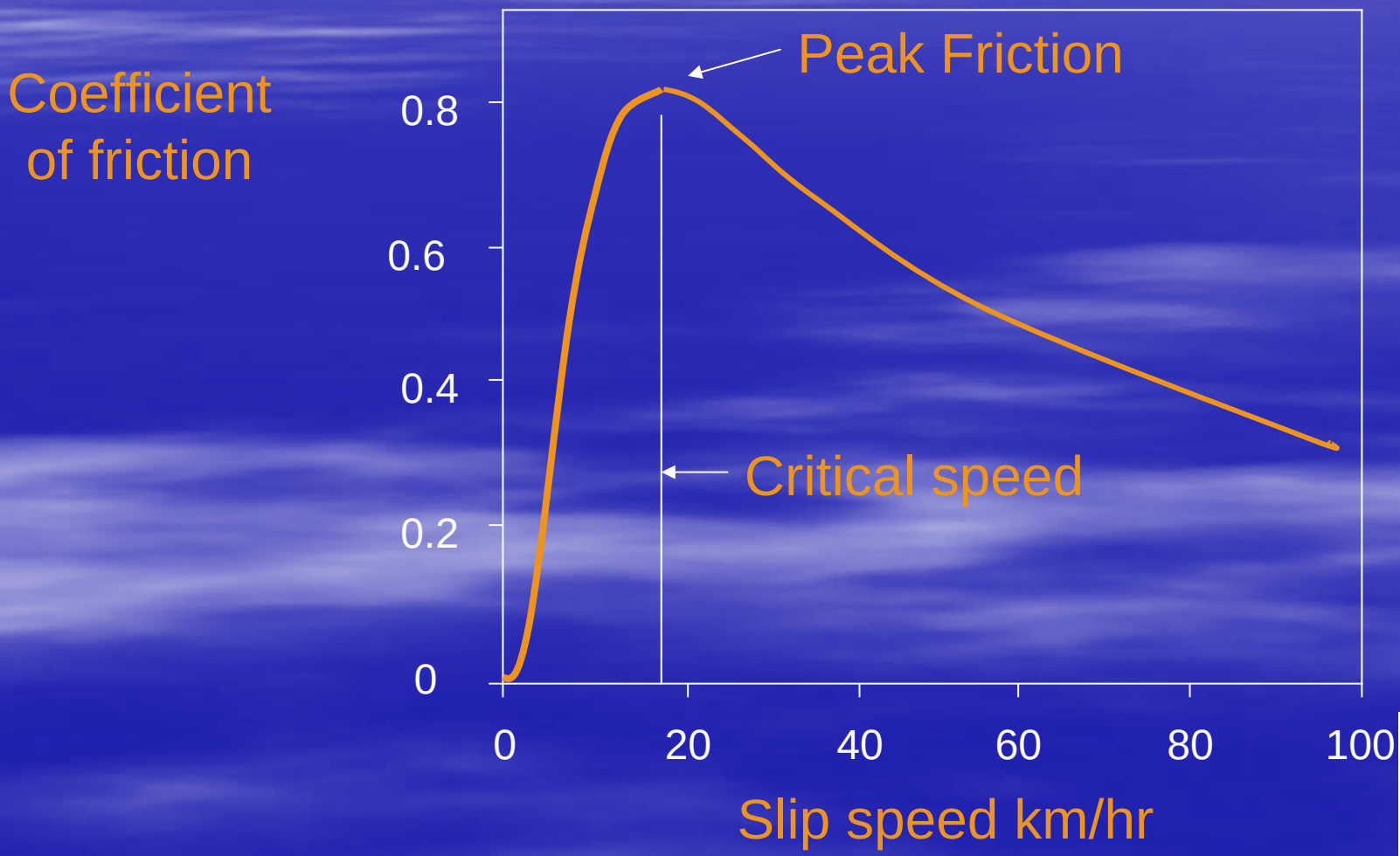
# The magnitude of the wet road accident problem.

| Location | Number of wet-road accidents | Number involving skidding | % skidding |
|---|---|---|---|
| GB | 83,659 | 23,602 | 28 |
| RURAL | 21,467 | 9,426 | 44 |
| URBAN | 62,192 | 14,176 | 23 |
| LONDON | 12,062 | 1,241 | 10 |

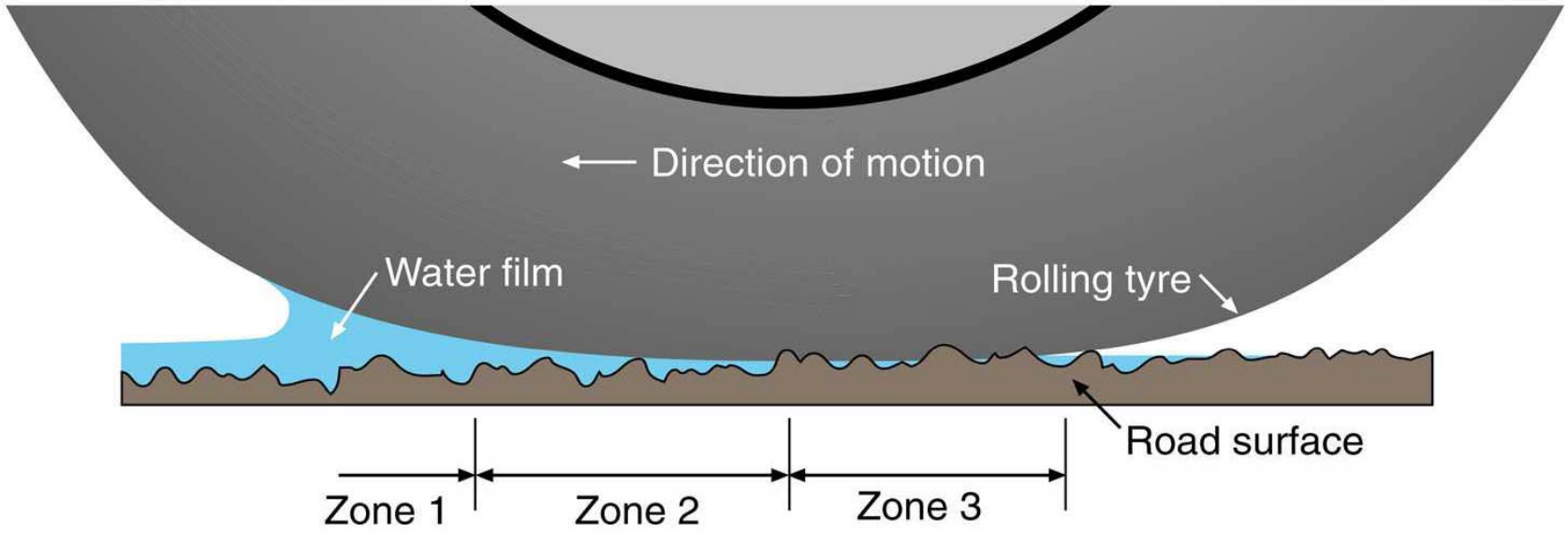
# From the beginning researching skidding resistance has been a serious business!



# The relationship between slip speed and friction on a road surface

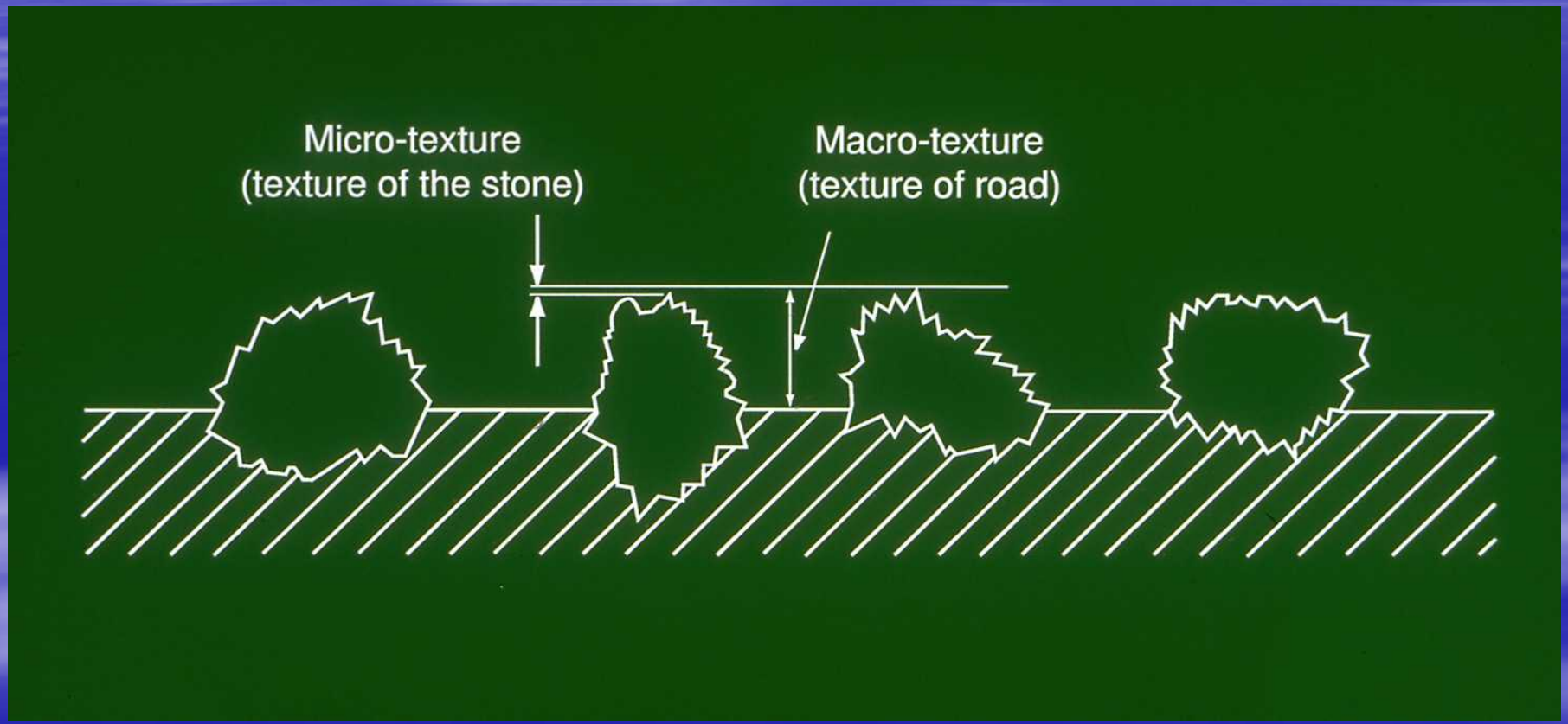


# The problem. To make good contact.

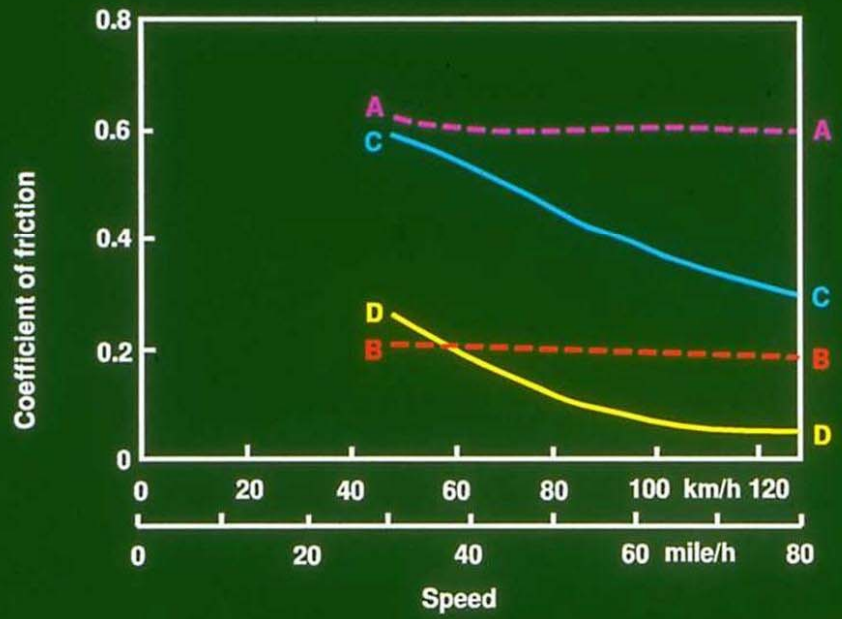


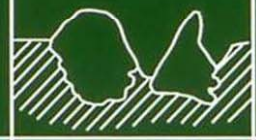

Zone 1: Continuous water film
Zone 2: Interrupted water film
Zone 3: Dry contact

# Skid resistance is controlled by macro and by micro texture.



# The influence of speed and texture on skid resistance.

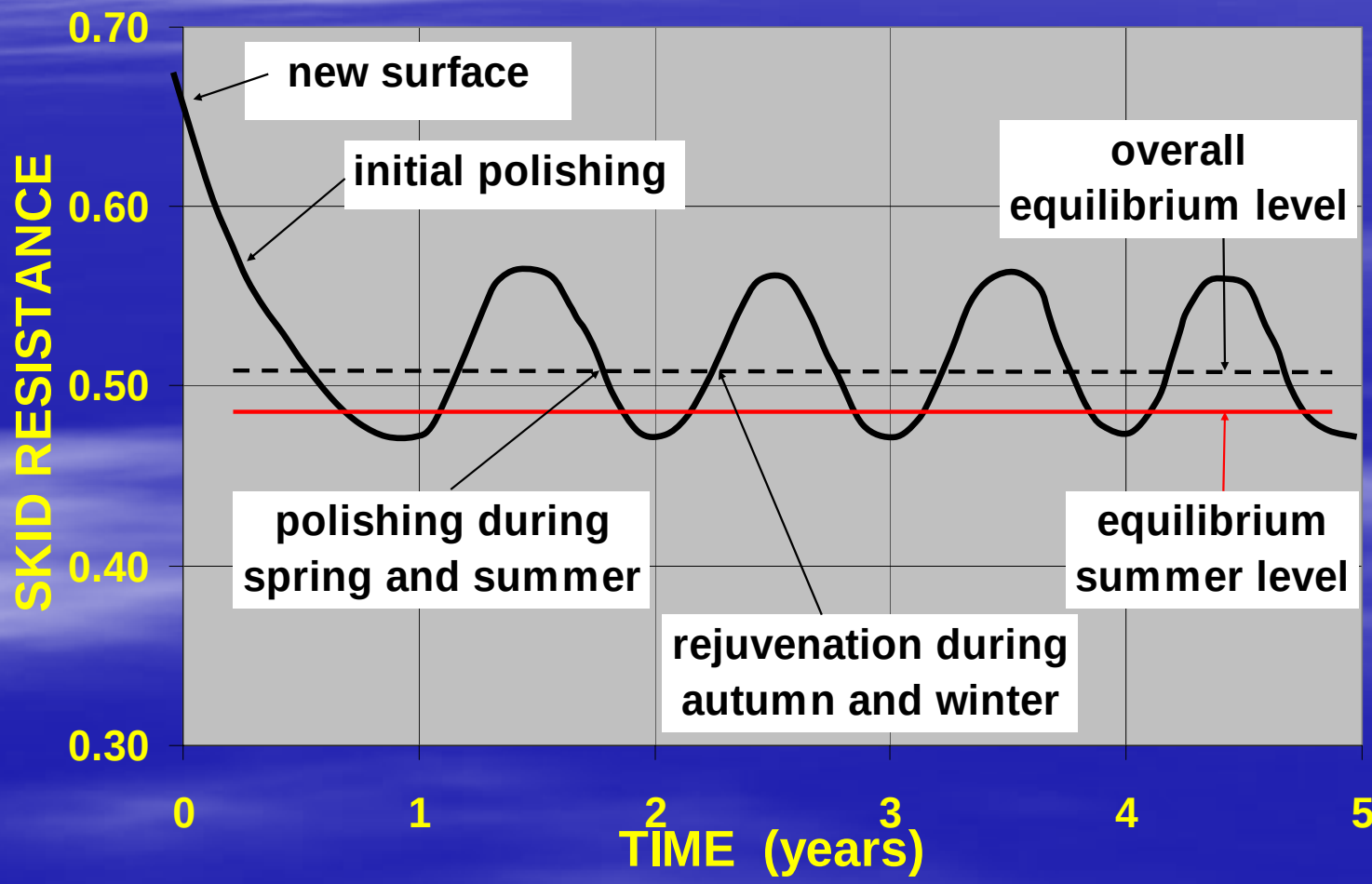



| SURFACE | | Scale of texture | |
|---|---|---|---|
| | | Macro (large) | Micro (small) |
| A |  | Rough | Harsh |
| B |  | Rough | Polished |
| C |  | Smooth | Harsh |
| D |  | Smooth | Polished |

# What is the equilibrium level of skid resistance?

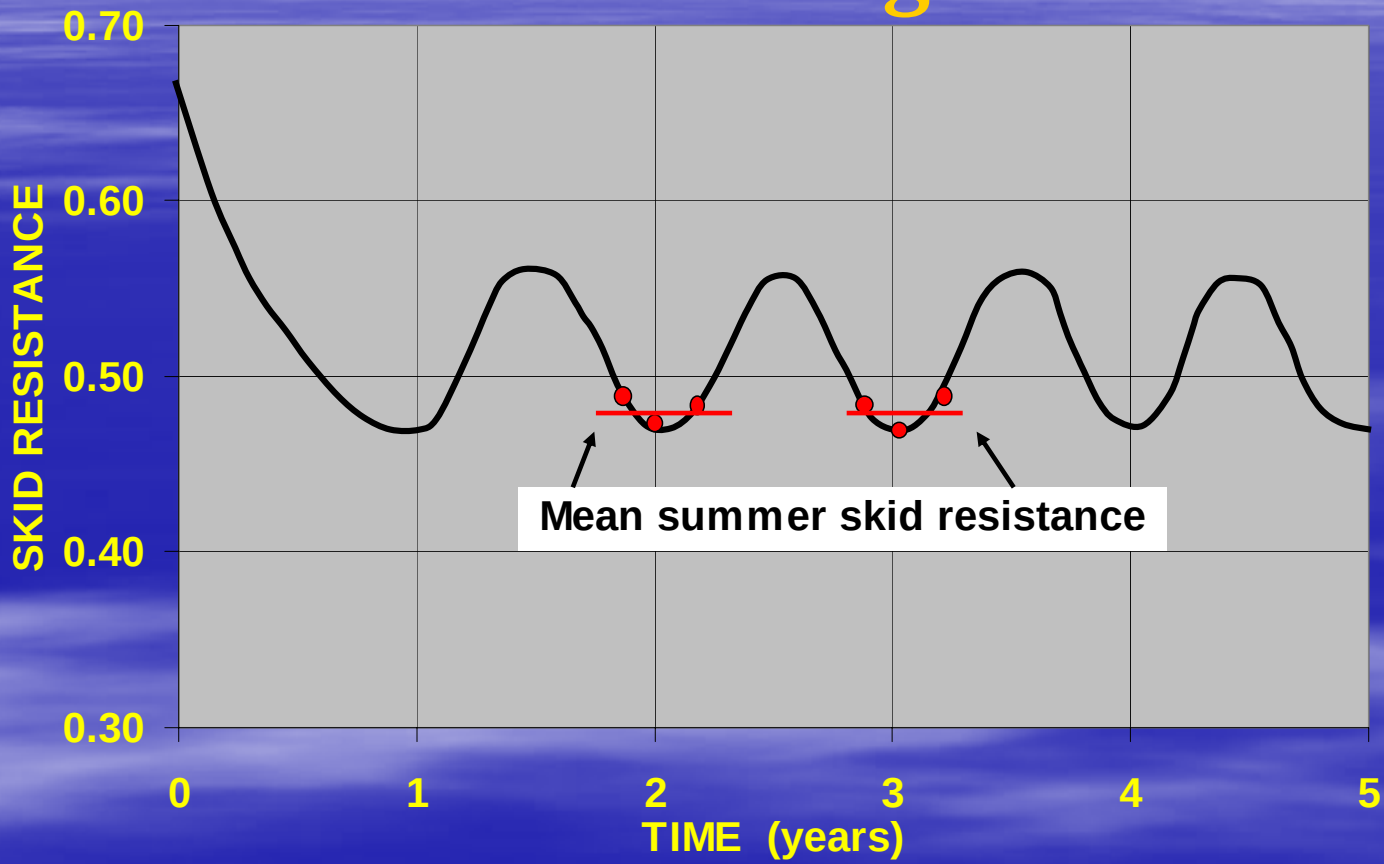
(Often referred to as the ultimate state of polishing)

# The development of equilibrium skid resistance.

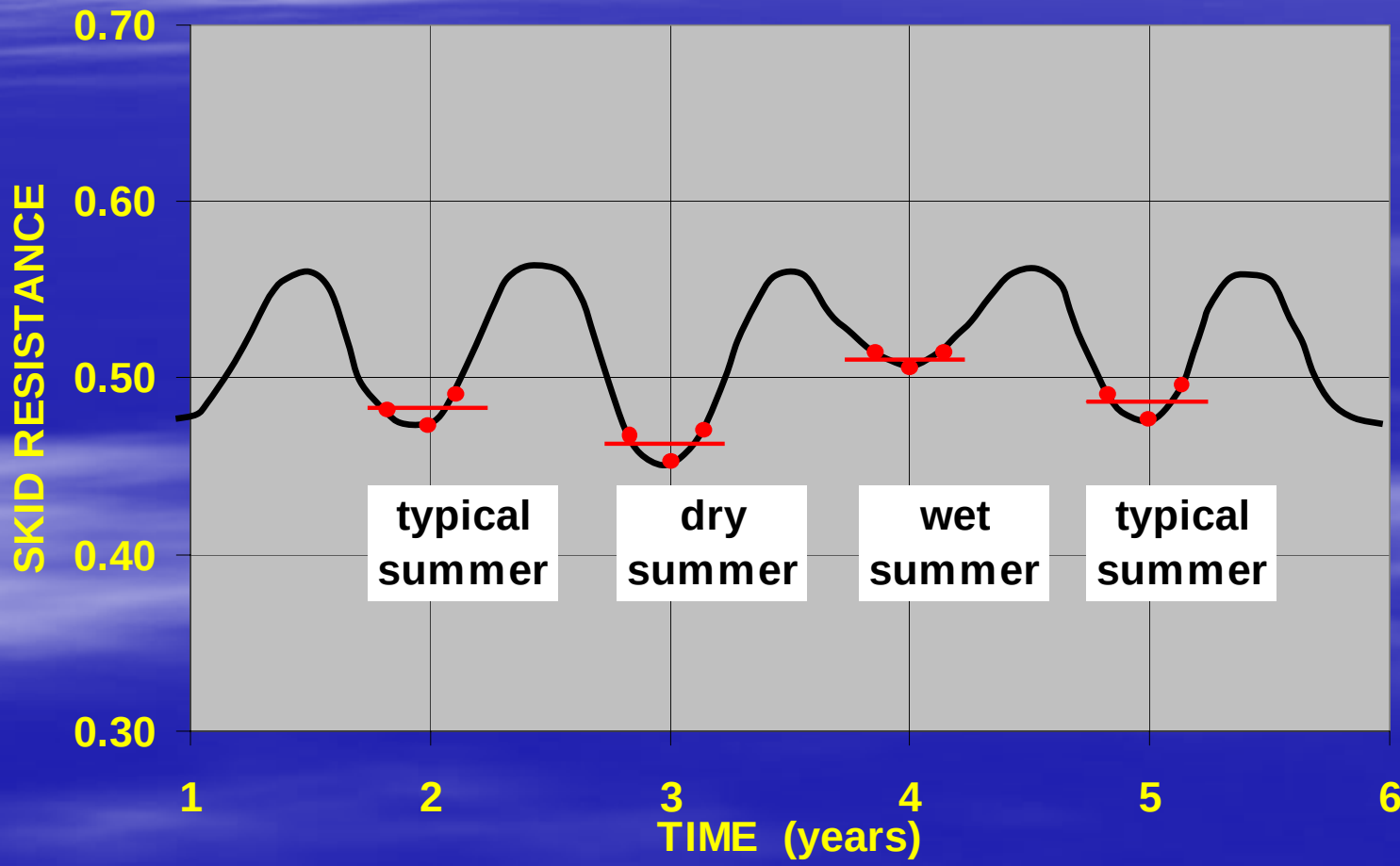


**How do we overcome the problem of seasonal variation in skid resistance?**

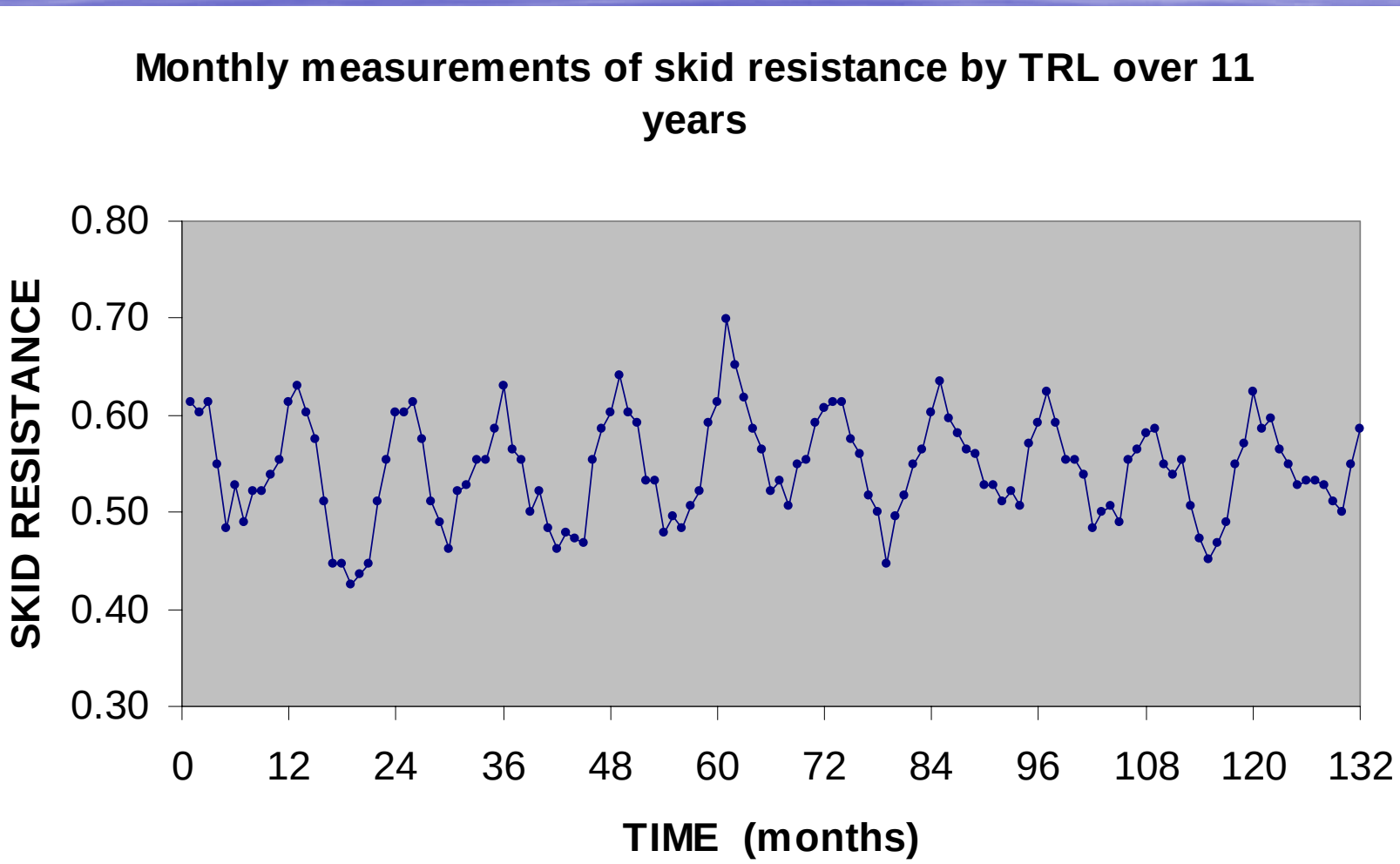
# Typically take more than one measurement during the summer months and average



# Unfortunately summers are not all the same.



# Real data!

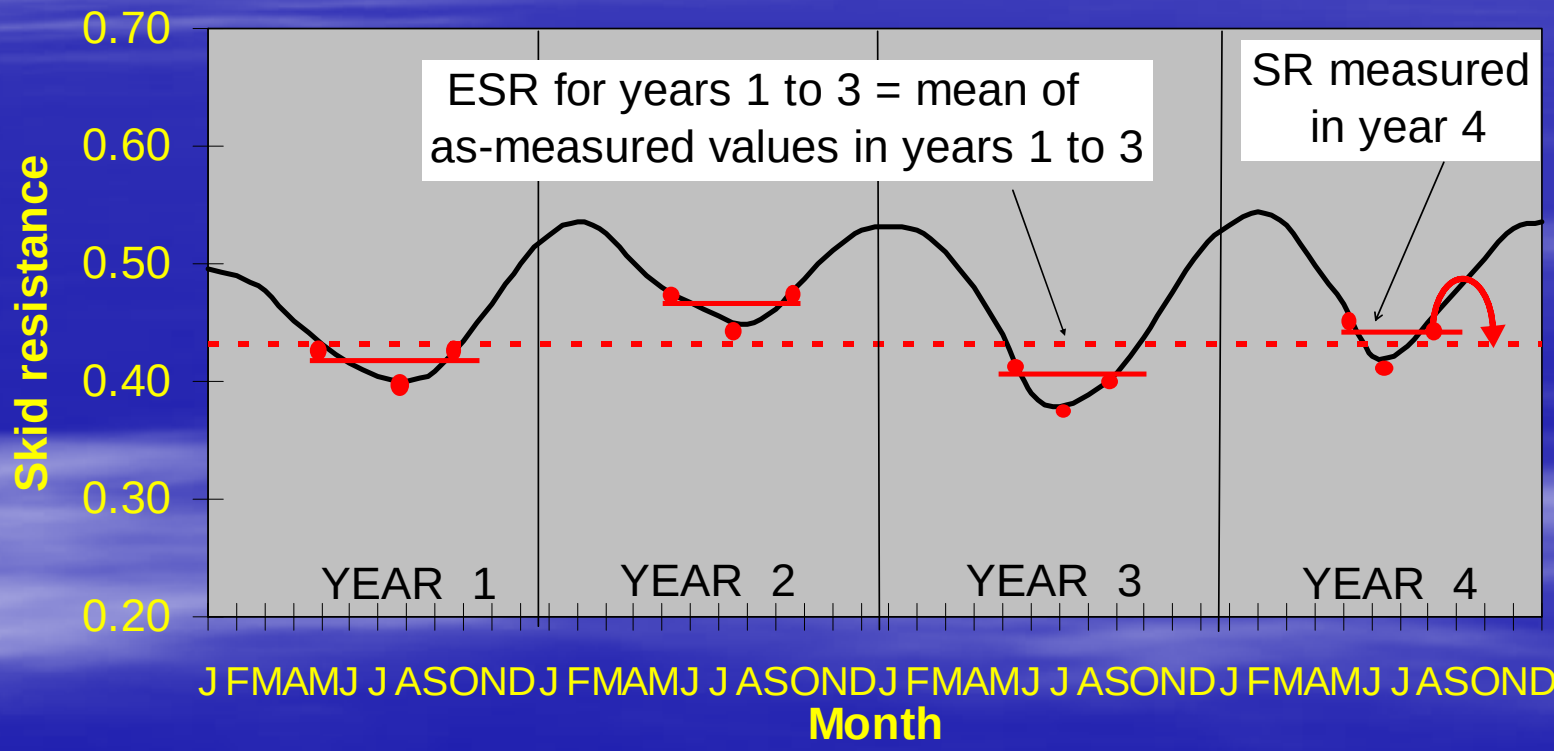

Monthly measurements of skid resistance by TRL over 11 years
SKID RESISTANCE
0.80
0.70
0.60
0.50
0.40
0.30
0
12
24
36
48
60
72
84
96
108
120
132
TIME (months)

# How can these risks be minimised?

**Adopt a new approach to surveys and/or the interpretation of measurements by allowing for both within year and between year variation.**

# Allowing for between and within year variation.

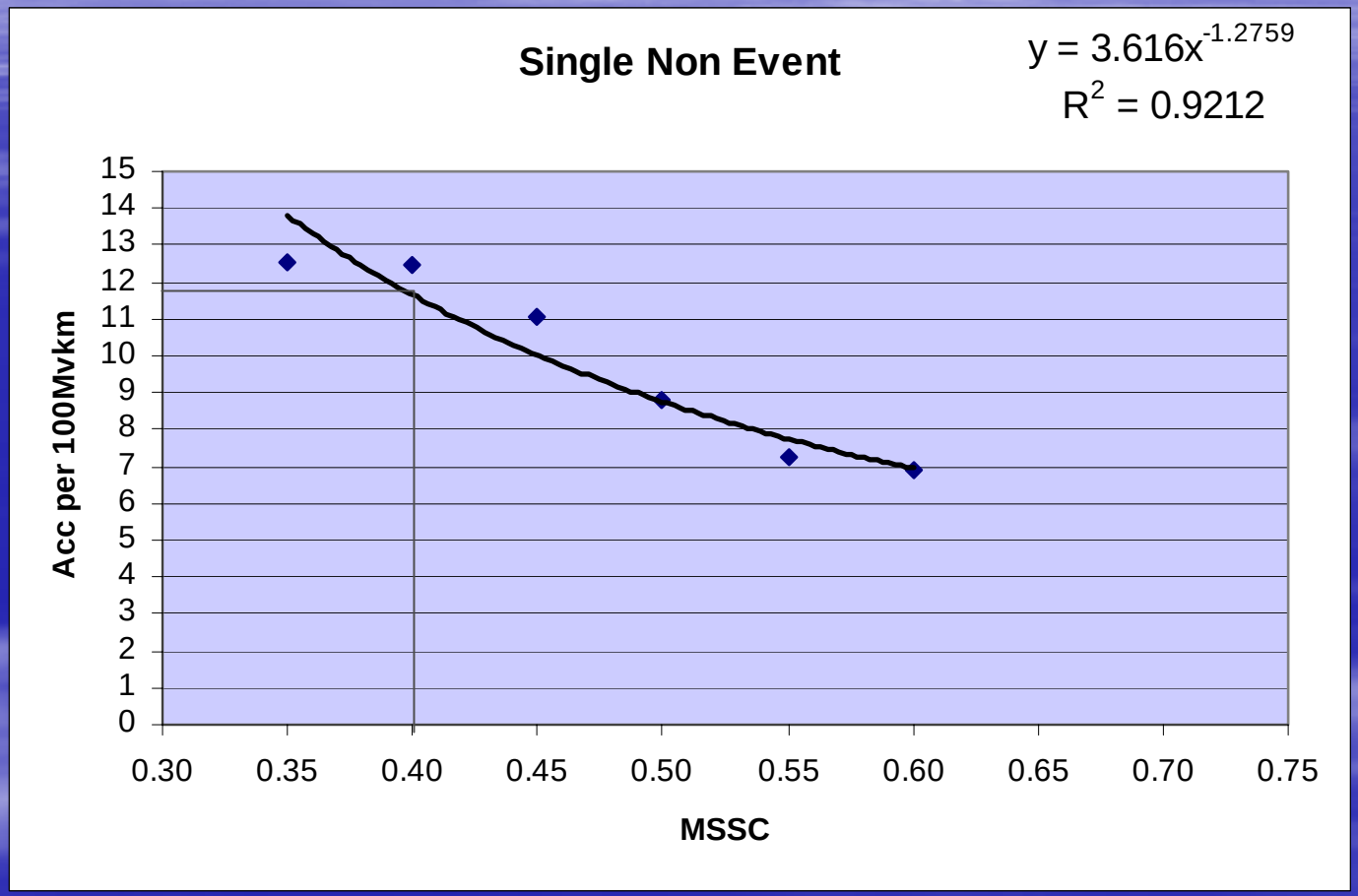
Correction factor is ESR divided by mean year 4 SR



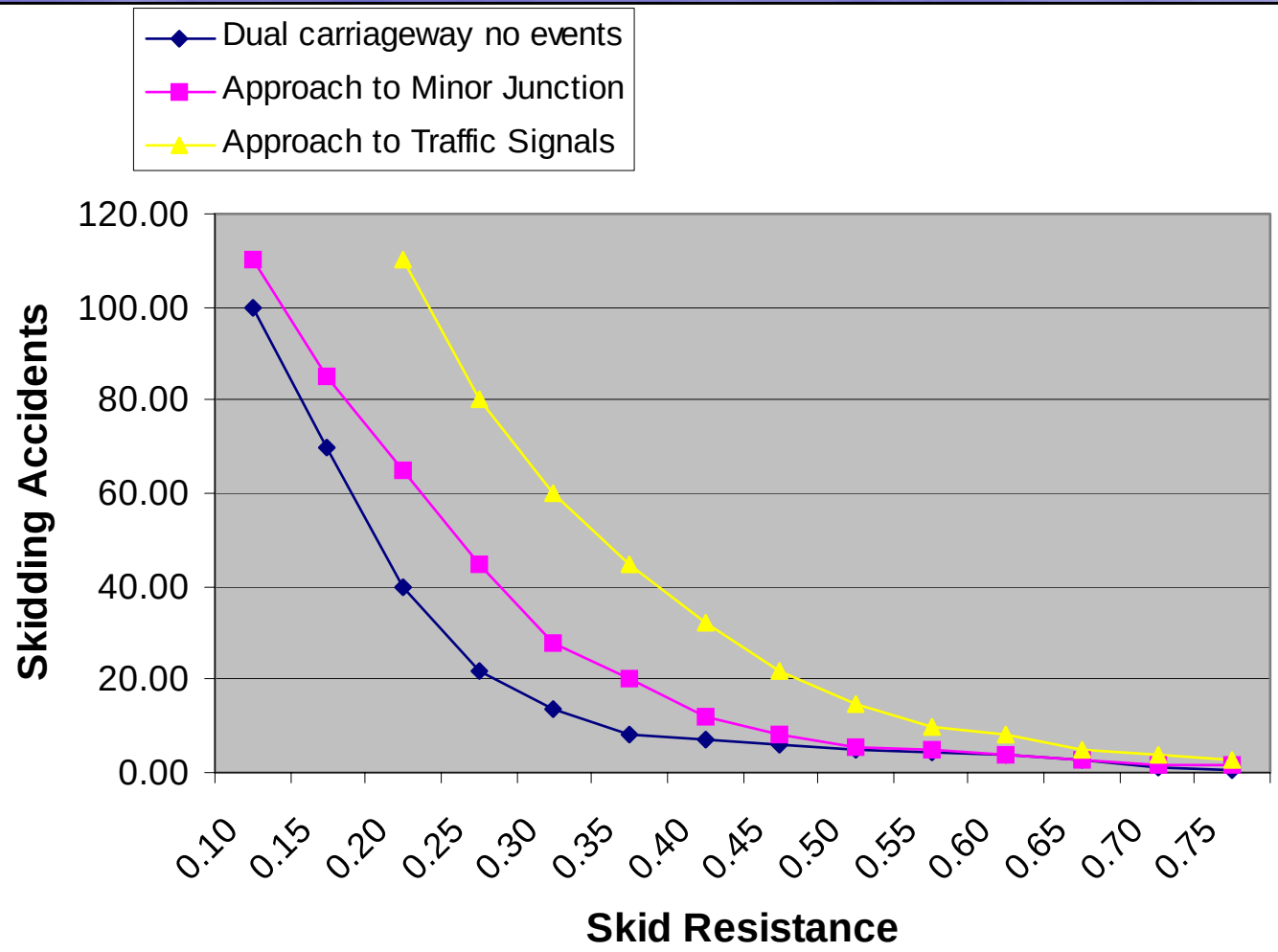
# What standards of skid resistance should be in a skid resistance policy?

**The aim of the skid policy is to minimise the risk of excessive wet road skidding accident rates anywhere on the network.**

# What is the standard?



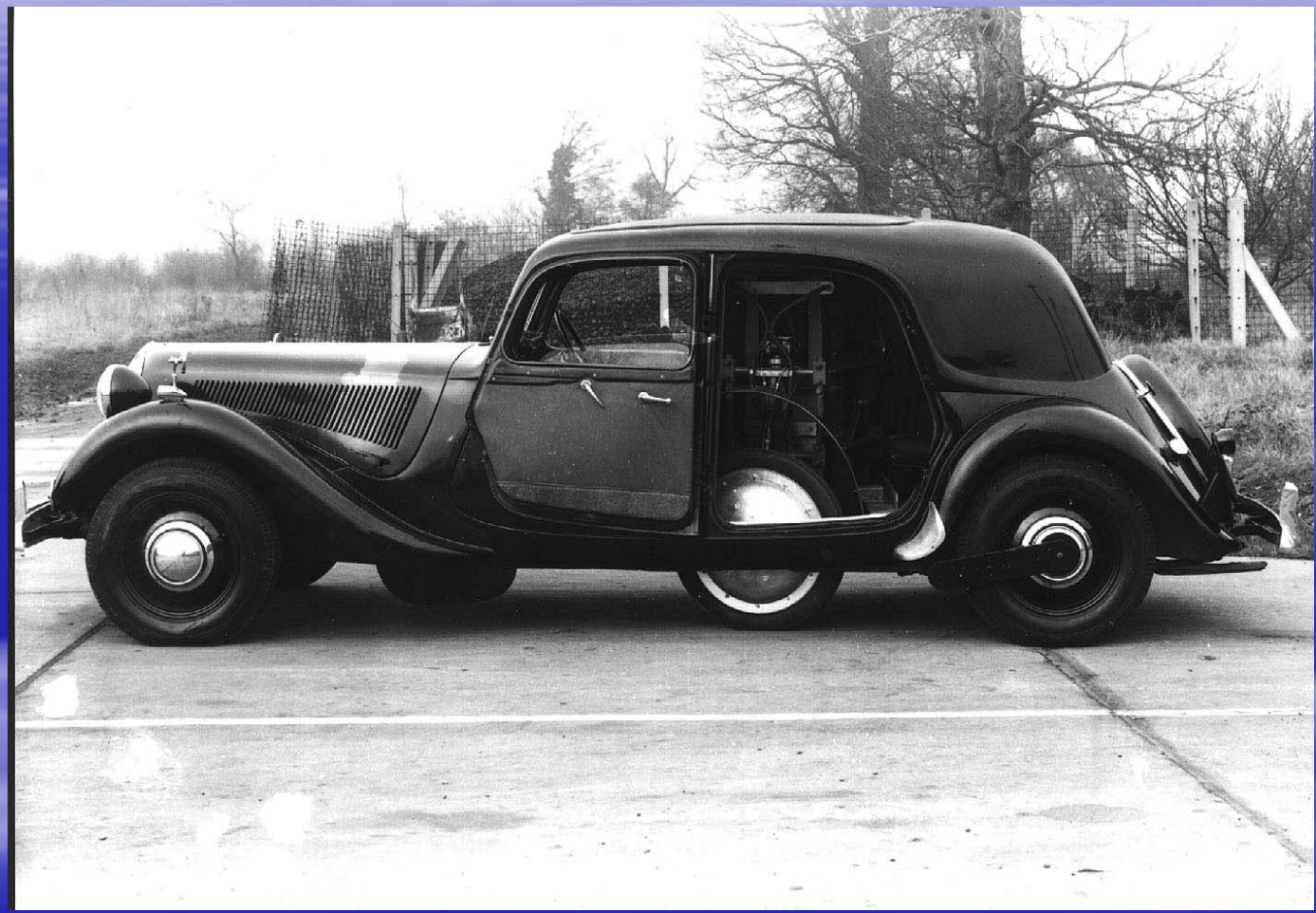
# Skid Resistance Versus Accidents



# Measurement of skid resistance

# In the beginning there was daring!

# Then we had style



# Then we lost our way and became pragmatic!

# Equipment in use today.

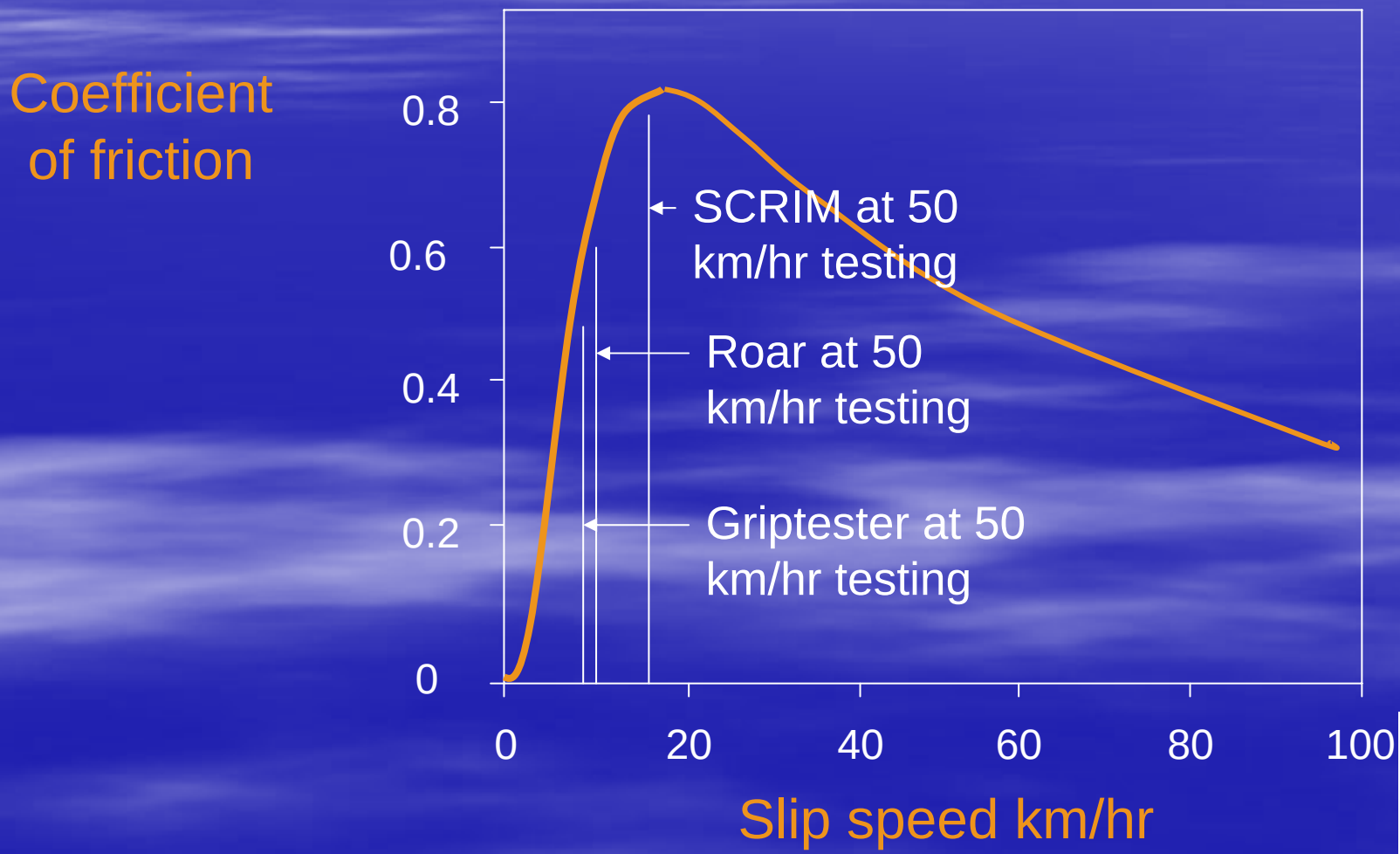
# Braking force trailer

# Roar - Variable or fixed Slip

# Fixed slip Griptester

# Sideways force-SCRIM

# The relationship between slip speed and friction on a road surface

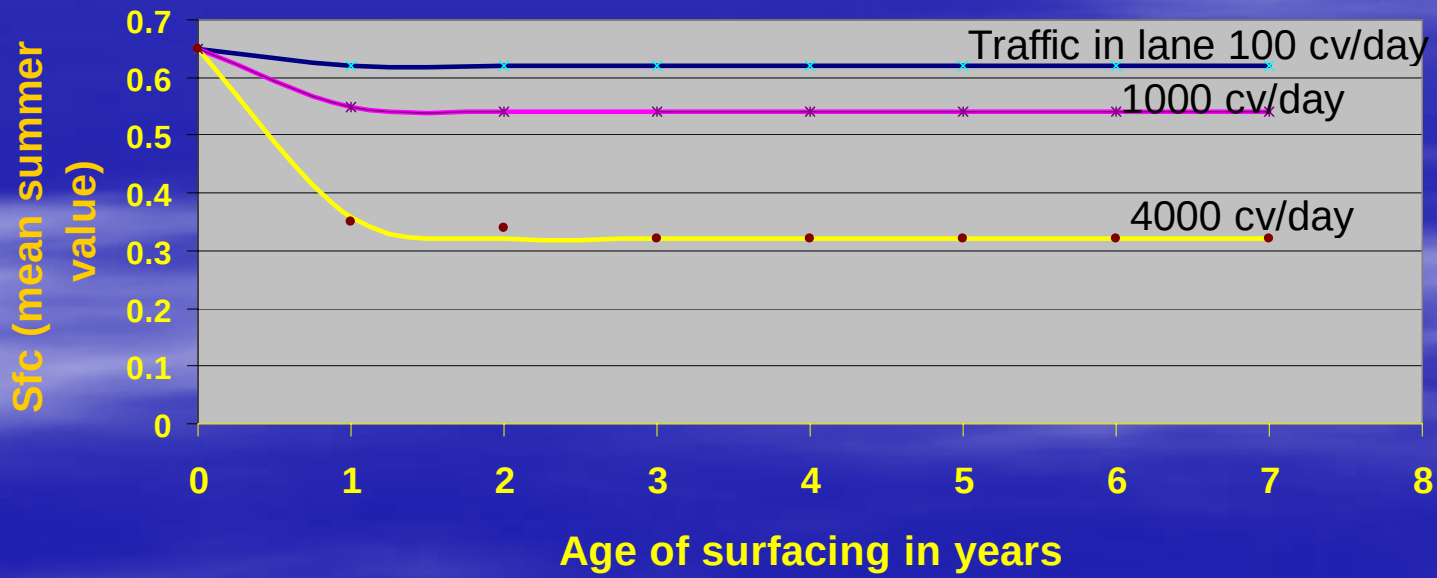


# Factors which influence skid resistance

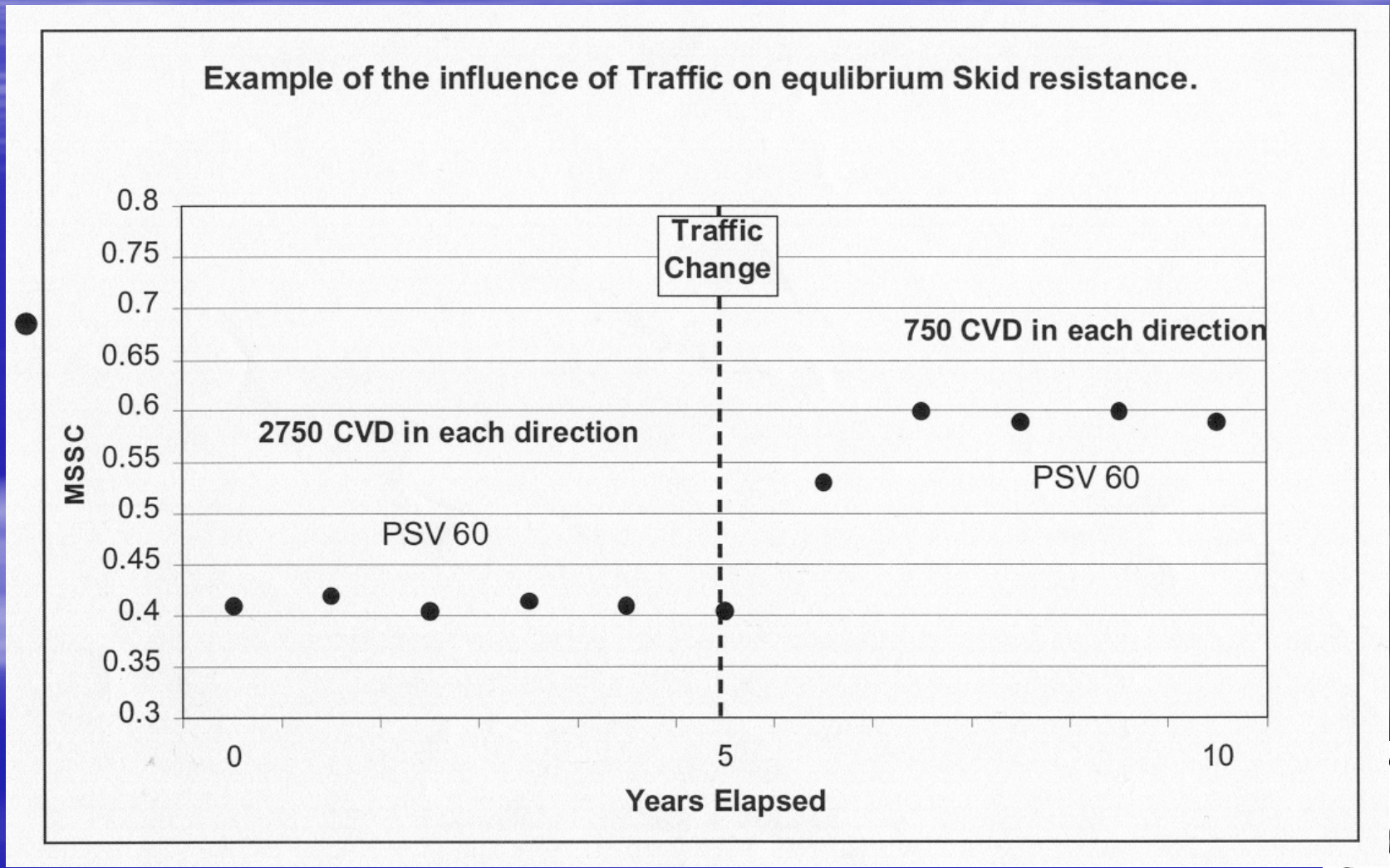
- Traffic
  - Daily total vehicles
  - Proportion of commercial vehicles;
  - effective horizontal force resulting from gradients;
  - accelerations and centrifugal forces;
  - speed.
- Surface layer
  - Coarse aggregate;
  - Grading;
  - Surface texture.
- Climate
  - Alternation between wet and dry periods
  - Temperature.

# The effect of traffic

**Effect of traffic on skid resistance for a typical motorway-standard surfacing (rolled asphalt with precoated chippings of say PSV 58-60)**

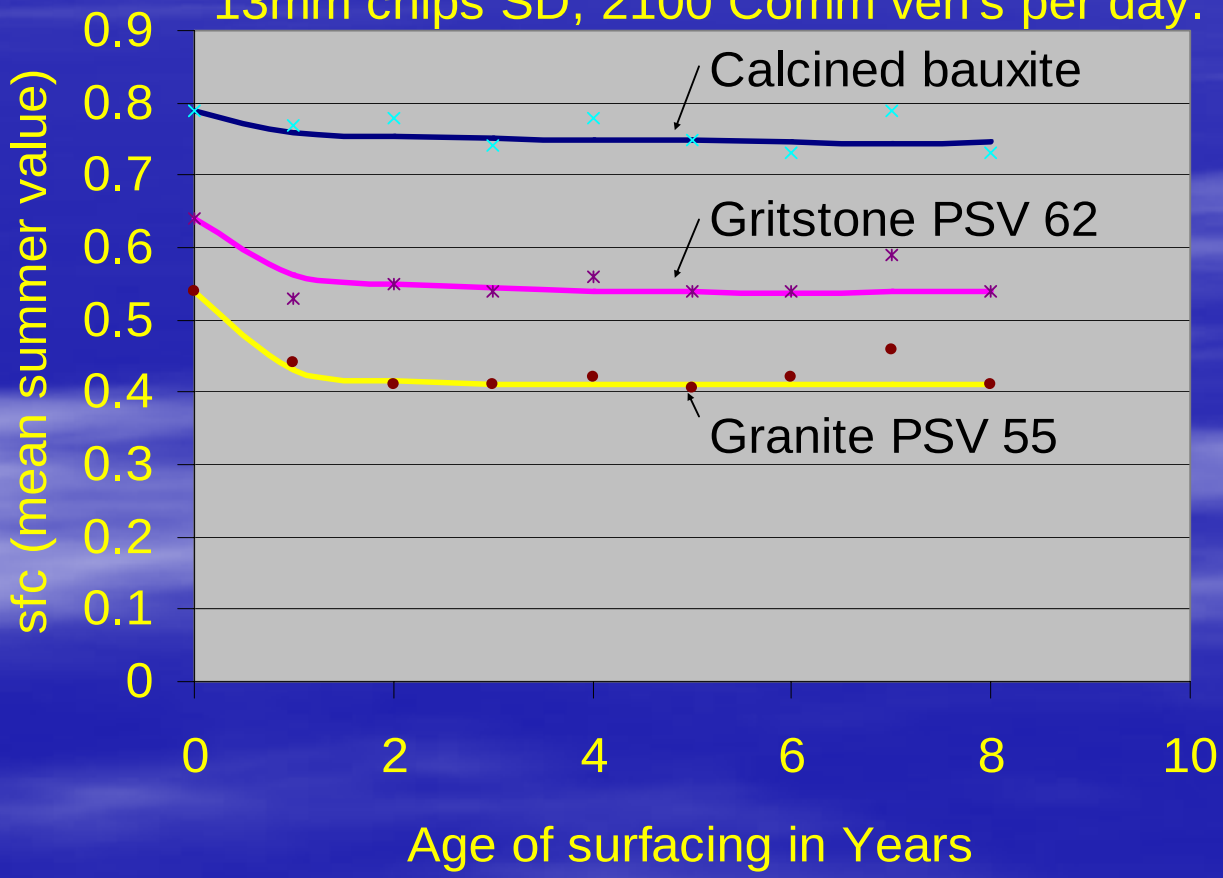


# Traffic effects can also be beneficial!



# The influence of aggregate type.

LEVELS OF SKID RESISTANCE RECORDED ON THE SAME ROAD.
13mm chips SD, 2100 Comm veh's per day.



# Selecting treatments:
# Use of the PSV – sfc equation.

PSV = 100 * SFC + Q * 0.00663 + 2.6

where

SFC is the MSSC/ESC required

Q = CV is the commercial vehicles / lane / day

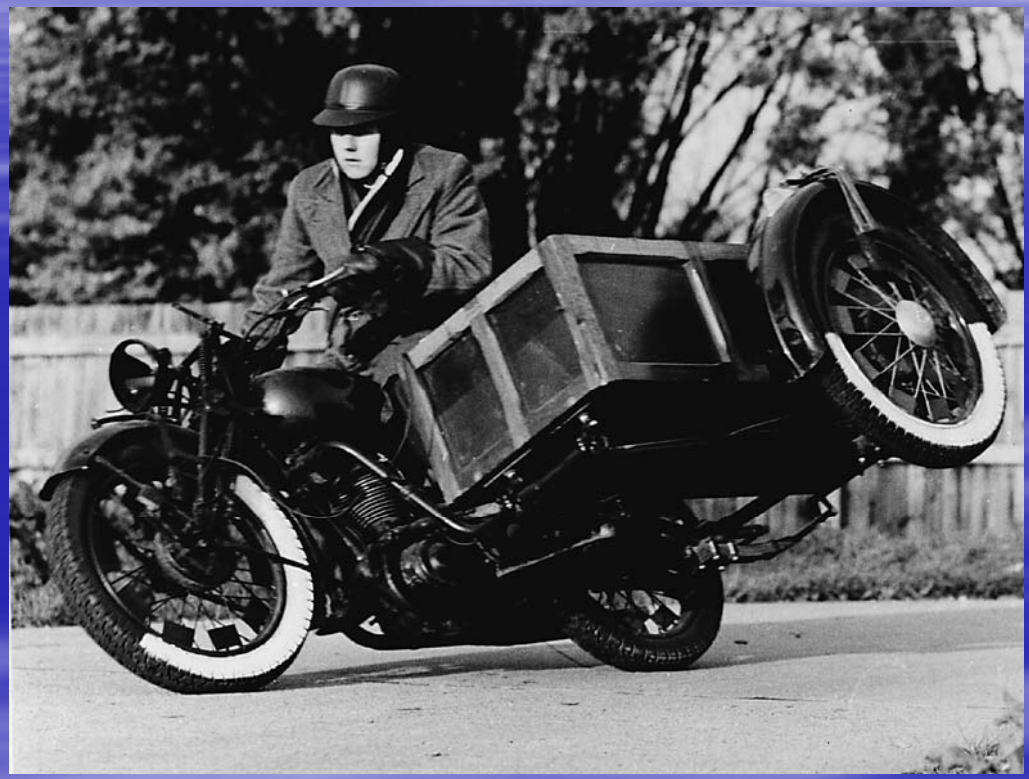
# In conclusion

- Myth No 1. Polishing is controlled by micro-texture not macrtotexture – big marbles are still marbles;
- Myth No 2. Skid resistance must be corrected for within and between year effects when used in a skid policy otherwise resources will not be used effectively;
- Myth No 3. There is no unique value for the ultimate state of polishing or equilibrium skid resistance as the values in the field are changing constantly;

# Conclusions 2

- Set investigatory levels in relation to accident rates.
- Myth No 4. Harmonisation means surveys with any piece of equipment can be procured and the results compared - Choose a piece of equipment and stick with it;
- Myth No 5. Resurfacing is the answer. Do not use the same aggregate source at a location where it has polished because it will polish again;
- Myth No 6. Use of the PSV – sfc equation is not a defence for slippery roads – use local knowledge to modify the equation.

# From the beginning researching skidding resistance has been a serious business!



**It should be because it makes a major contribution to road safety at low cost and provides probably the best way of producing future reductions in accidents.**