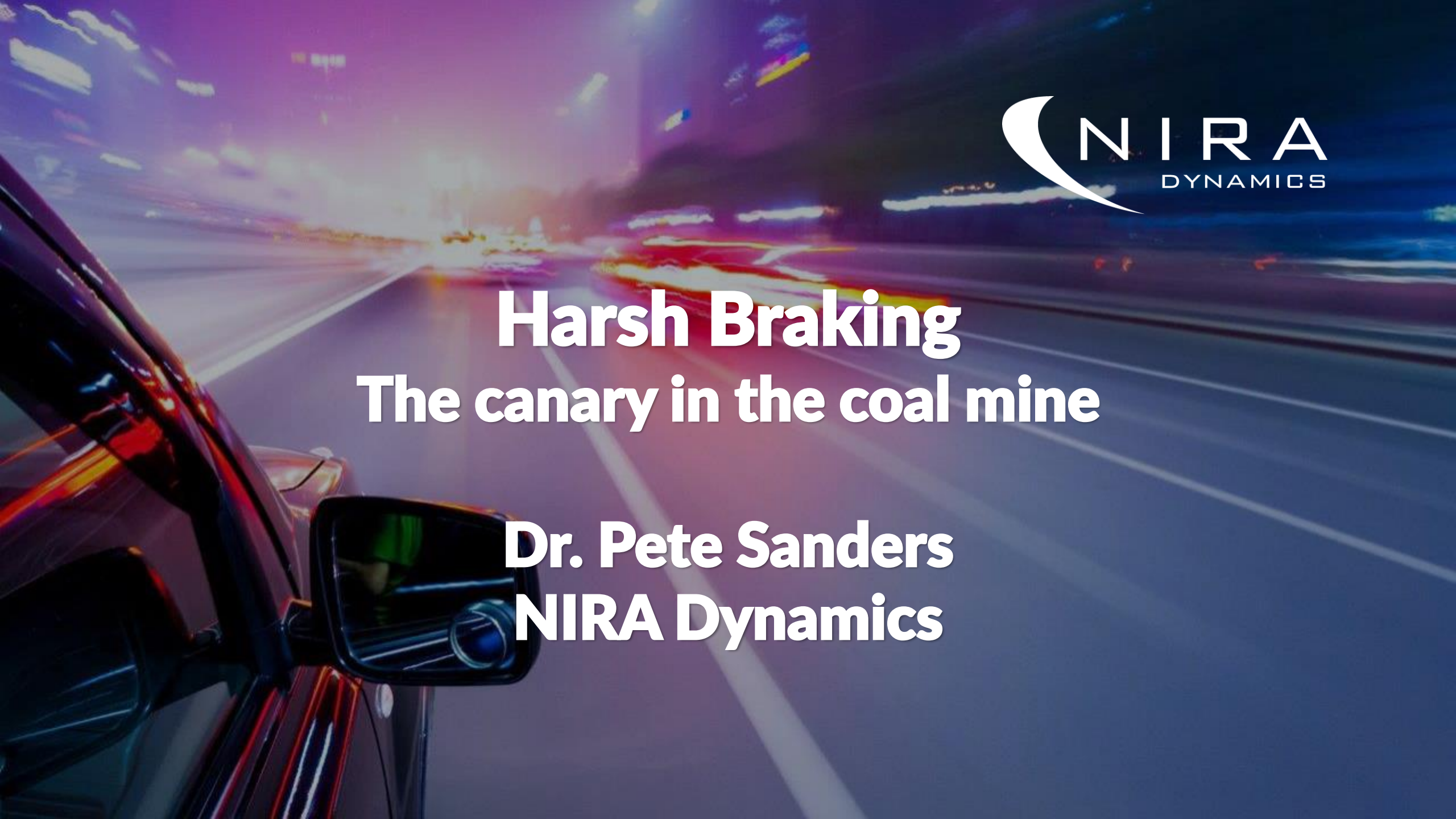


Harsh Braking
The canary in the coal mine

Dr. Pete Sanders
NIRA Dynamics

An introduction to NIRA Dynamics

Volkswagen Group

Tire Grip Indicator data

OEM backend

NIRA

Weather data + NIRA backend

=

Results
Friction Map
Roughness Map

Products

- Road Surface Alerts
- Road Health
- Road Surface Conditions
- Winter Road Insights

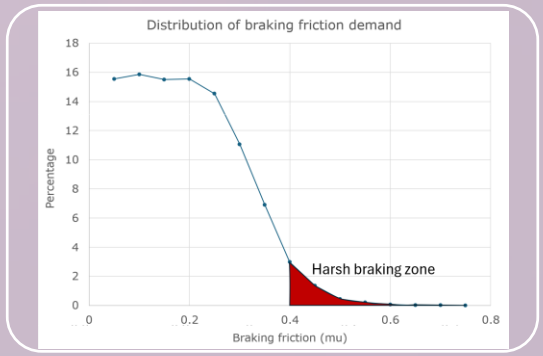
Using the unique volume power of the Volkswagen Group with over 2.000.000 vehicles p.a.

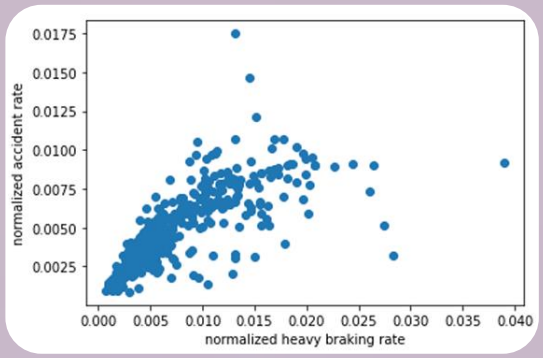
Already available in **Europe & North America.**

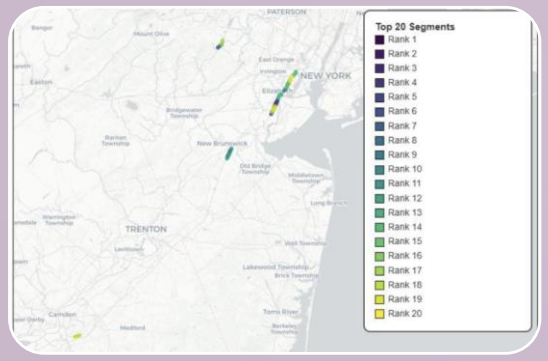
GDPR-compliant anonymized aggregated data.

NIRA DYNAMICS

Harsh braking events 101







Instance of high vehicle deceleration

OR

high braking friction

Correlated with accident risk [1] [3] and a good indicator of risk [2].

Allow the identification of high-risk locations [1], and inform targeted interventions.

1. Hossain, T. (2025) *Harsh Braking as a Surrogate for Crash Risk: A Segment-Level Analysis with Connected Vehicle Telematics.* NJDoT.
2. Nikolaou, D., Ziakkopoulos, A., Yannis, G. (2023) A Review of Surrogate Safety Measures Uses in Historical Crash Investigations. Technical University of Athens.
3. Lelke, T., Sanders, P,. Franke, S,. Friedrich, B. (In Publication) *Assessment of Urban Traffic Safety through the Analysis of Crowd-Sourced Heavy Braking Maneuvers.*

In other words…

Harsh braking events can be used to identify high risk locations BEFORE accidents occur.

They are the canary in the coal mine for road safety.

BUT…

NIRA DYNAMICS

…we've been here before.

Survivors of the Senghenydd colliery disaster 1913

Miners in the early 1900s often had a false sense of security.

Canaries were used as rudimentary gas detectors.

Canaries, are **exceptional** at detecting **carbon monoxide**…

…but are **terrible** at detecting **methane**.

Low friction, harsh braking's methane

Harsh braking events are **not recorded** when:

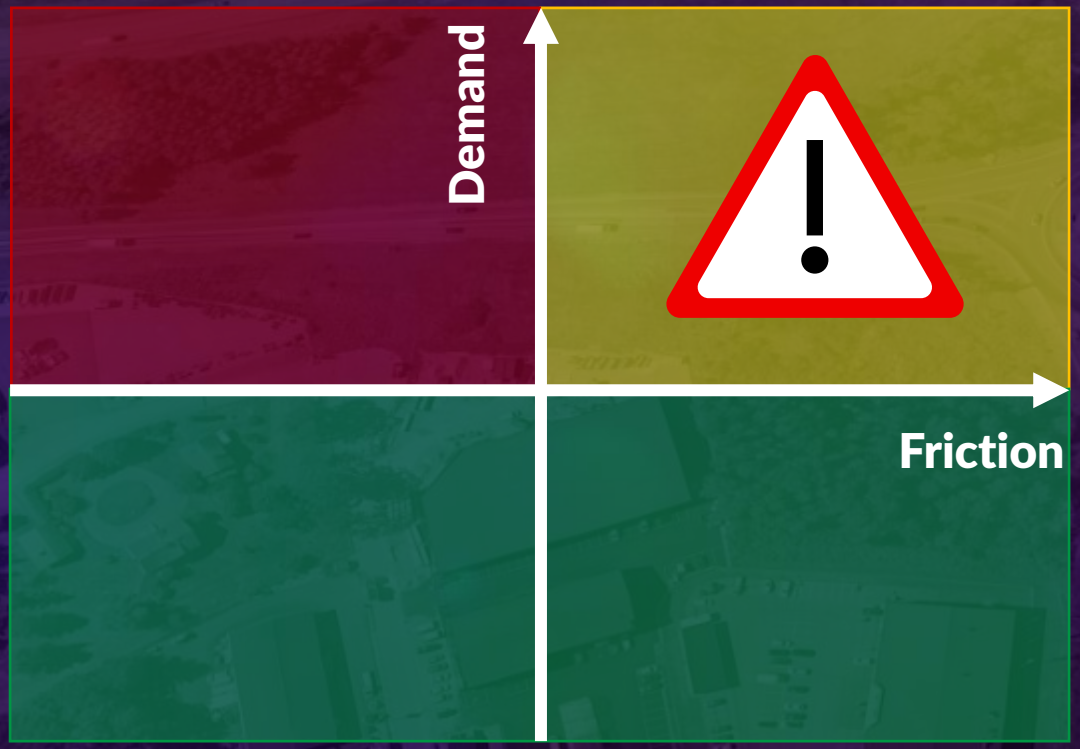
1. There is high driver demand AND
2. low tyre-road friction.

i.e. (the canary is bad at detecting CH_4).

Harsh braking events are **recorded** when:

1. There is high driver demand AND
2. high tyre-road friction.

i.e. (the canary is good at detecting CO).



Harsh braking events are not recorded when there is low driver demand

NIRA DYNAMICS

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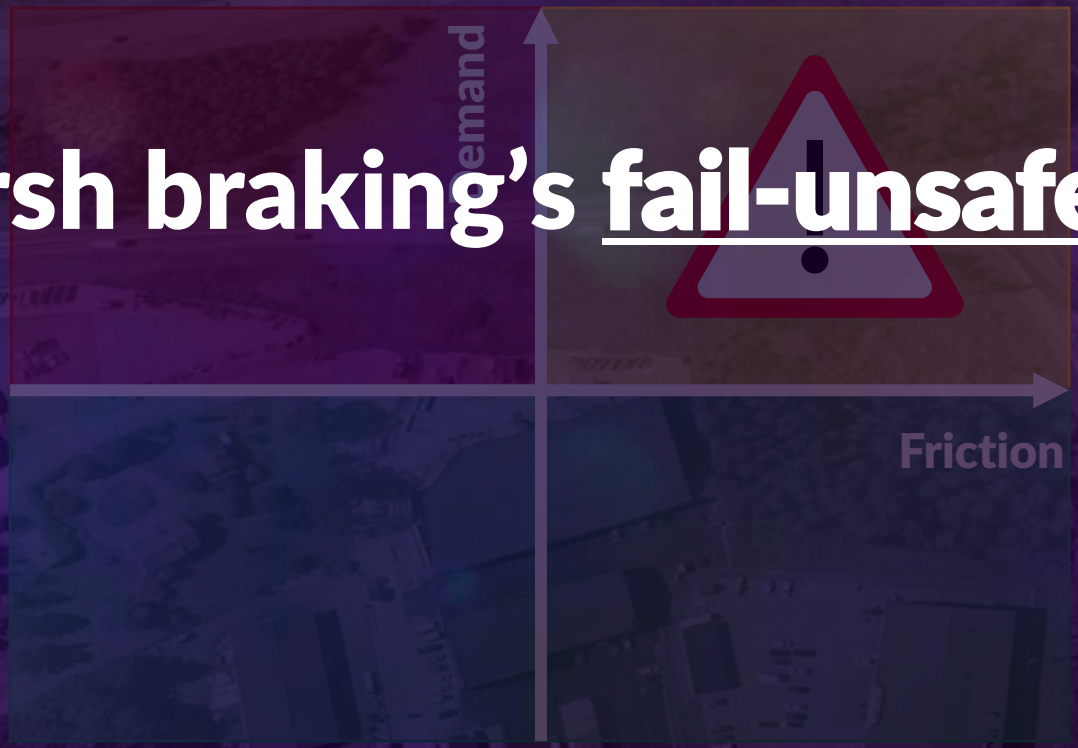


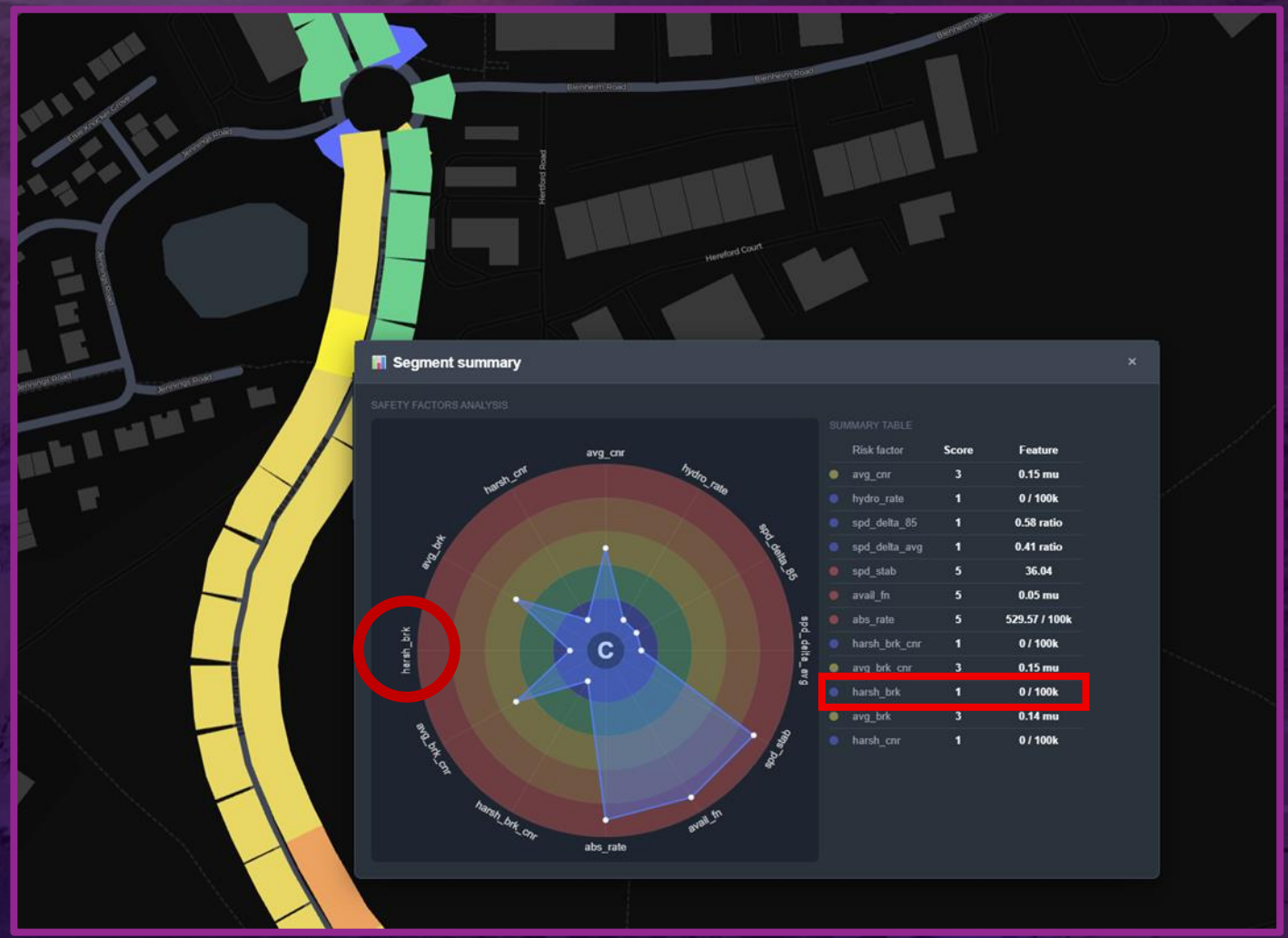
This is harsh braking's fail-unsafe condition.

Harsh braking events are not recorded when there is low driver demand

NIRA DYNAMICS

The harsh braking fail-unsafe condition

Case study

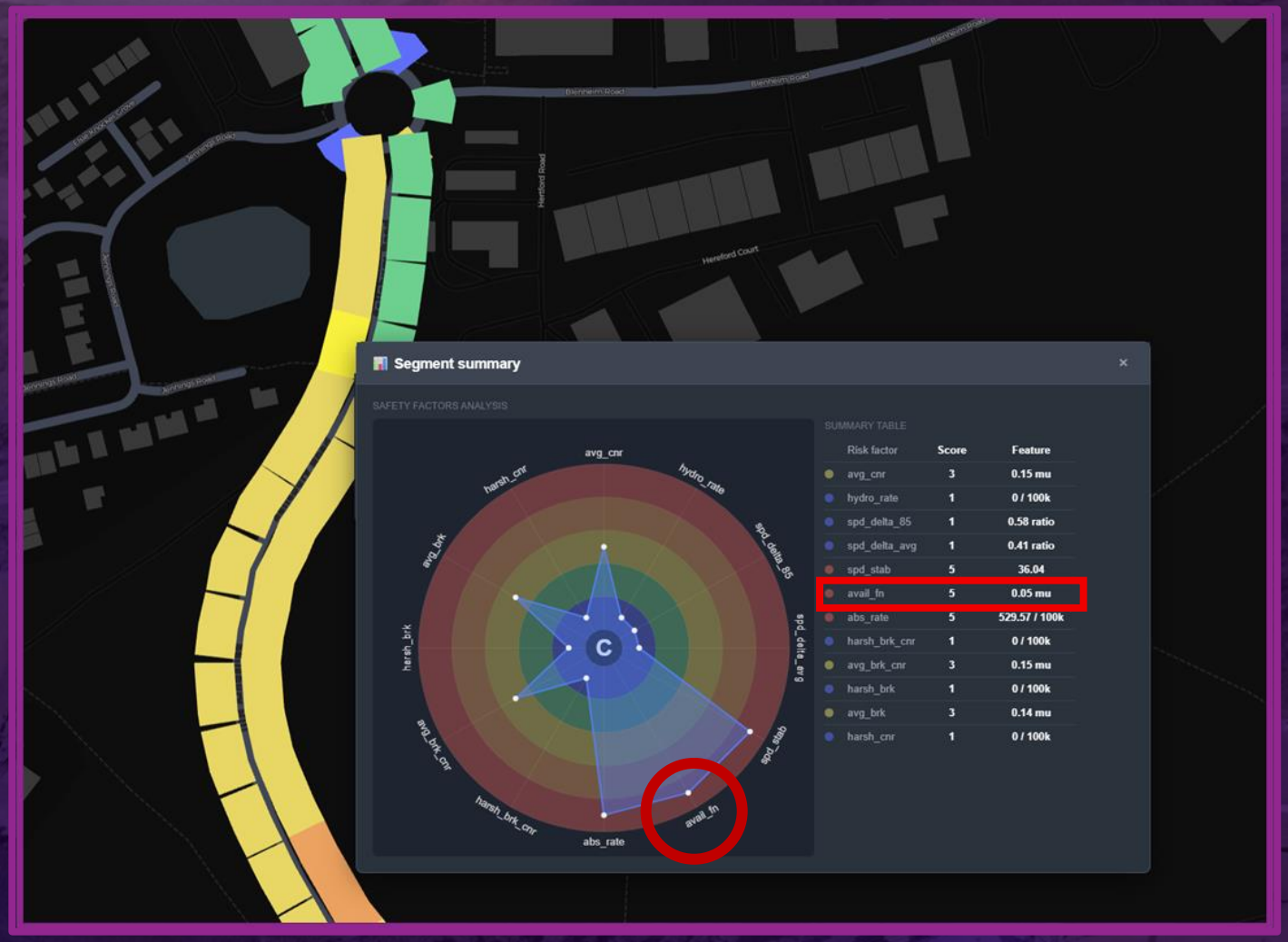


In this example:

- **The harsh braking rate is zero**

The harsh braking fail-unsafe condition

Case study



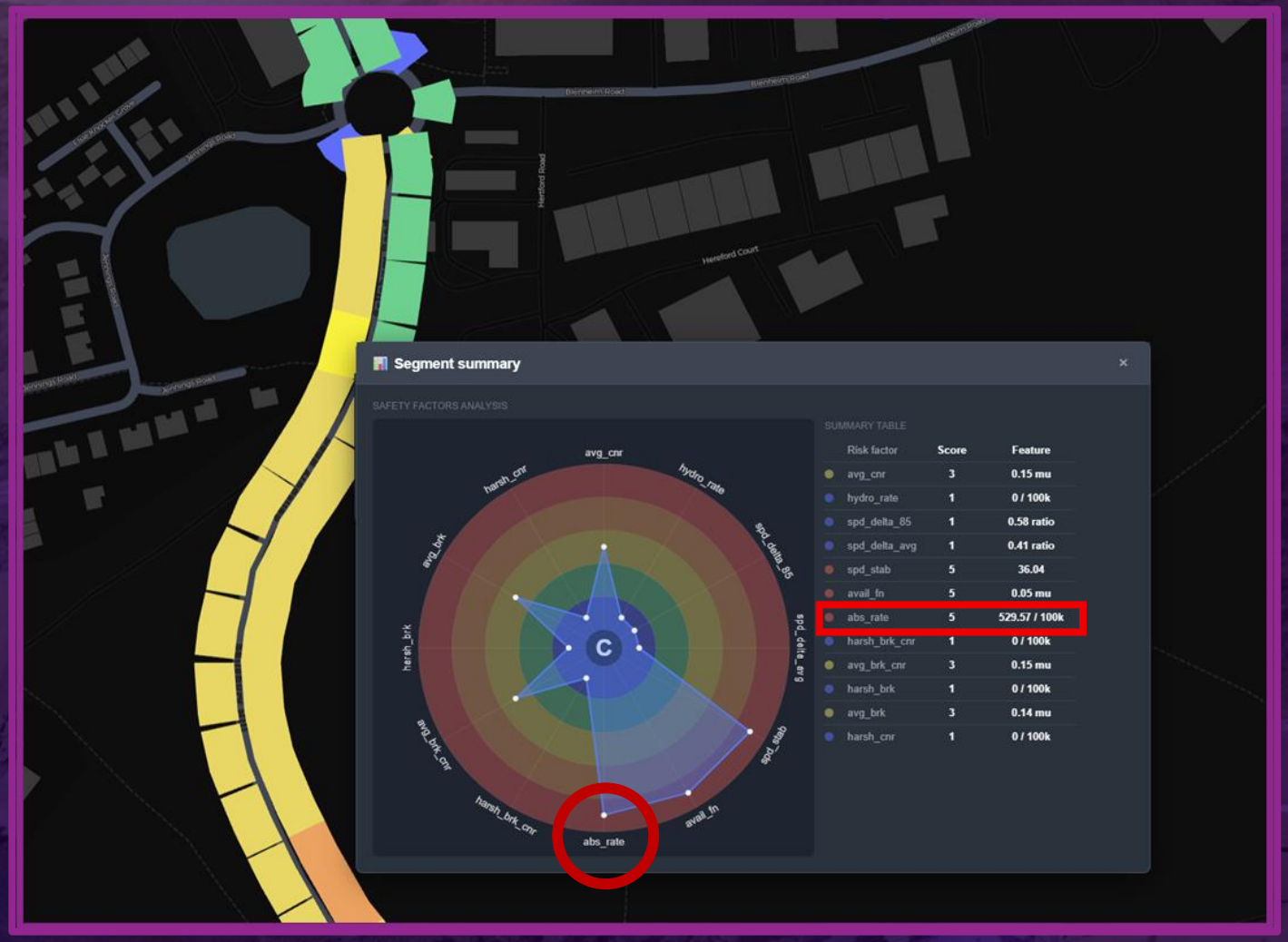
In this example:

- **The harsh braking rate is zero, and**
- **The friction is very low**

NIRA DYNAMICS

The harsh braking fail-unsafe condition

Case study



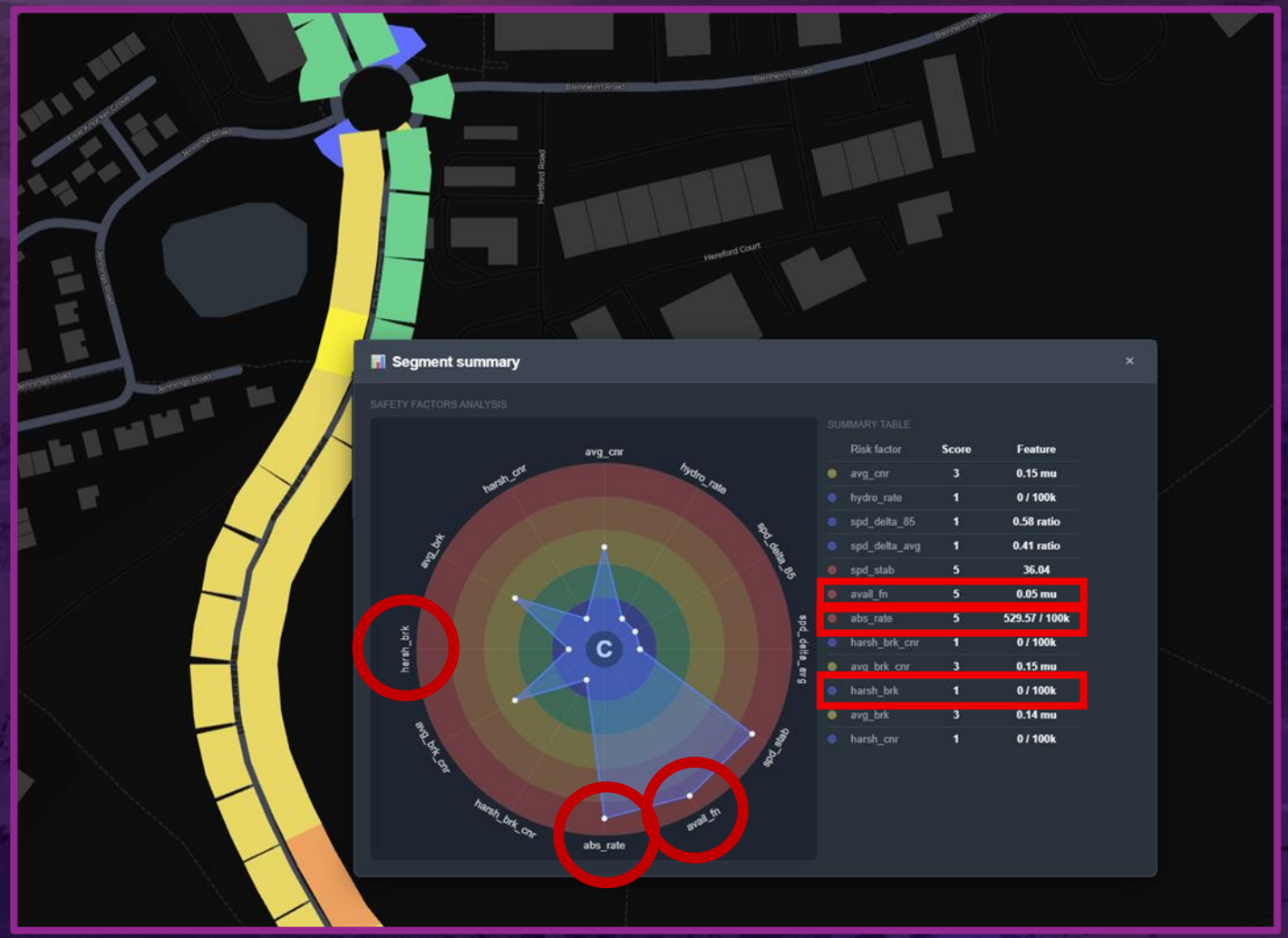
In this example:

- **The harsh braking rate is zero, and**
- **The friction is very low, but**
- **The abs rate is very high.**

NIRA DYNAMICS

The harsh braking fail-unsafe condition

Case study



In this example:

- **The harsh braking rate is zero, and**
- **The friction is very low, but**
- **The abs rate is very high.**

This site clearly therefore poses a risk to motorists but would go undetected if we looked at harsh braking maneuvers alone.

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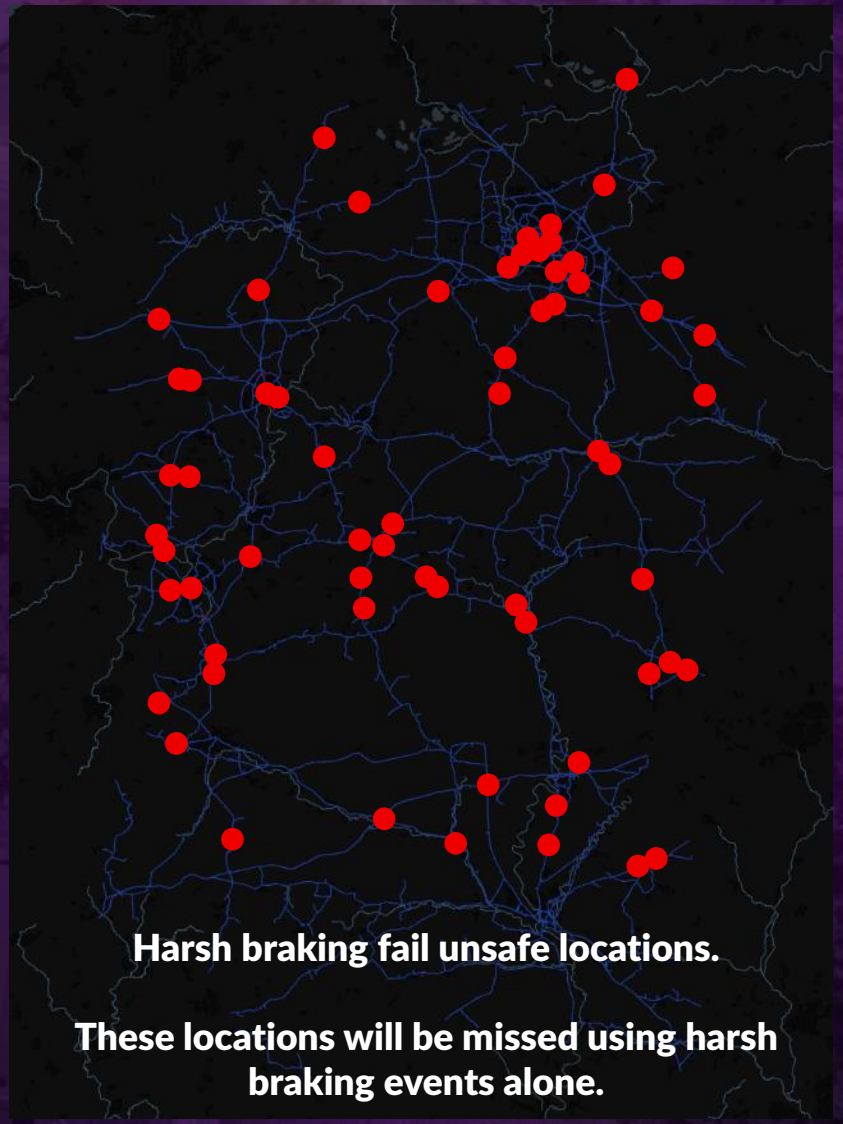
The solution – ABS activations

NIRA Dynamics ABS activation data are used to calculate the ABS rate.

ABS events, combined with harsh braking events, can identify locations where the harsh braking fail unsafe condition is met (right).

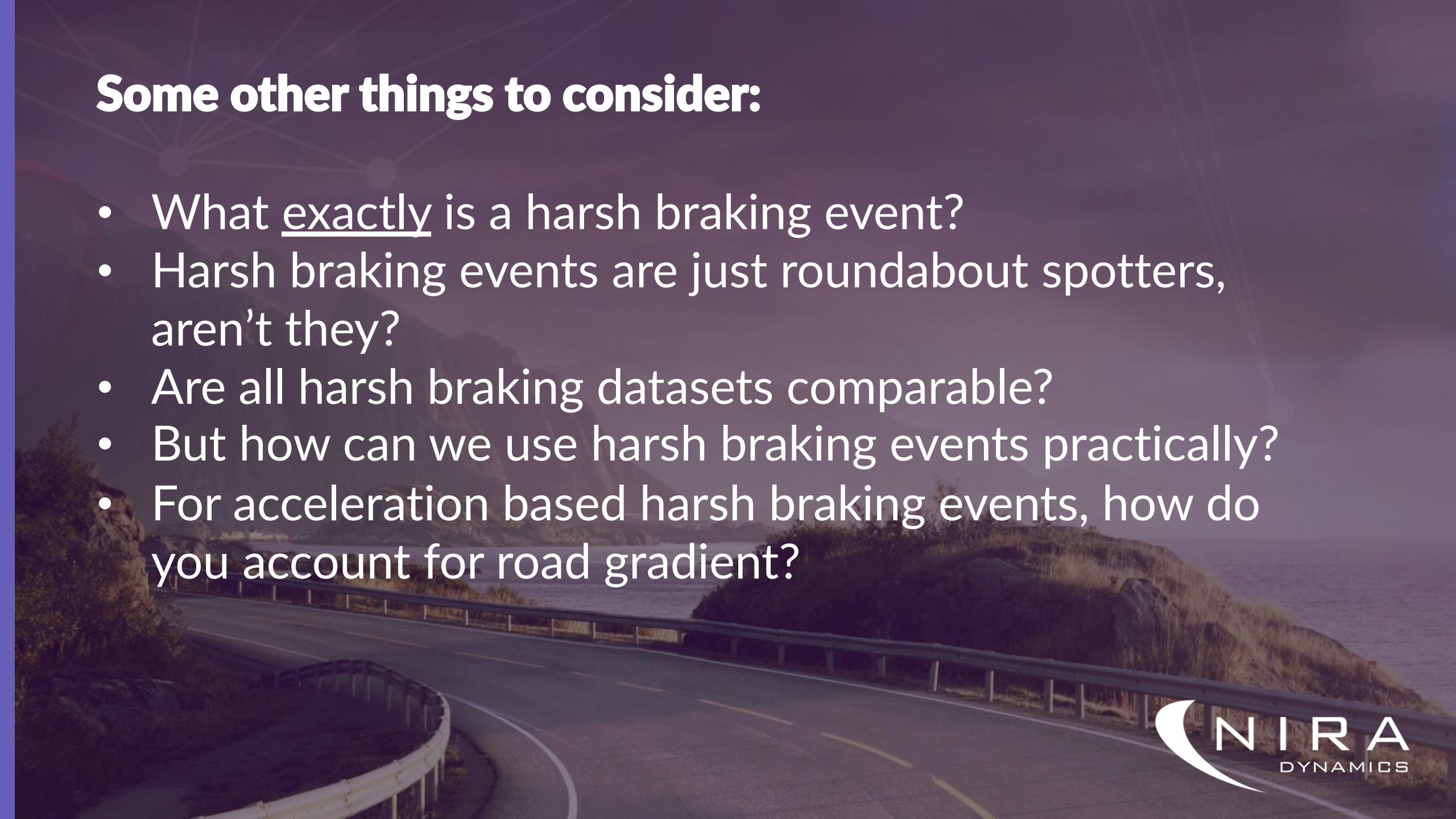


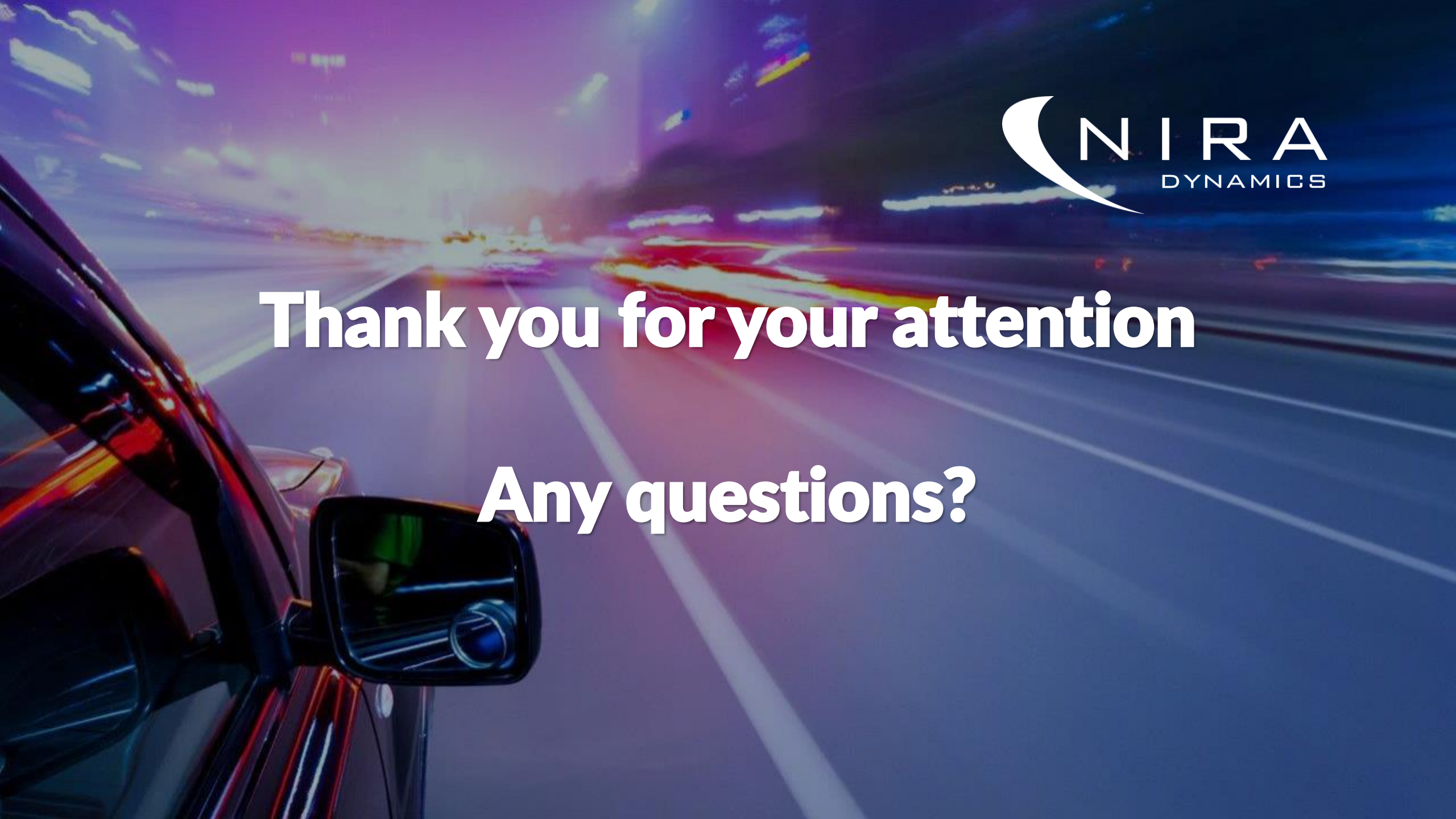
Harsh braking fail unsafe locations.

These locations will be missed using harsh braking events alone.

Some other things to consider:

- What exactly is a harsh braking event?
- Harsh braking events are just roundabout spotters, aren't they?
- Are all harsh braking datasets comparable?
- But how can we use harsh braking events practically?
- For acceleration based harsh braking events, how do you account for road gradient?

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DYNAMICS
Thank you for your attention
Any questions?