VTRC
Virginia Transportation Research Council

We bring innovation to transportation.

Virginia Quiet Pavement Demonstration Program

Kevin K. McGhee, P.E.

2015 RPUG Meeting - Raleigh

Virginia “Quiet Pavements” Program *(Code of Virginia § 33.1-223.2:21)*

- **Directs VDOT to:**
  - *Expedite the development of quiet pavement (QP) technologies such that applicable contract solicitations include specs for QP technology if sound mitigation is a consideration.*
- **To that end, VDOT will:**
  - *Construct demonstration projects to assess QP technologies.*
  - *Monitor and report results of use of QP technologies in other states.*
  - *Evaluate functionality/ safety in Virginia's climate over four full winters.*

“Quieter” Pavement

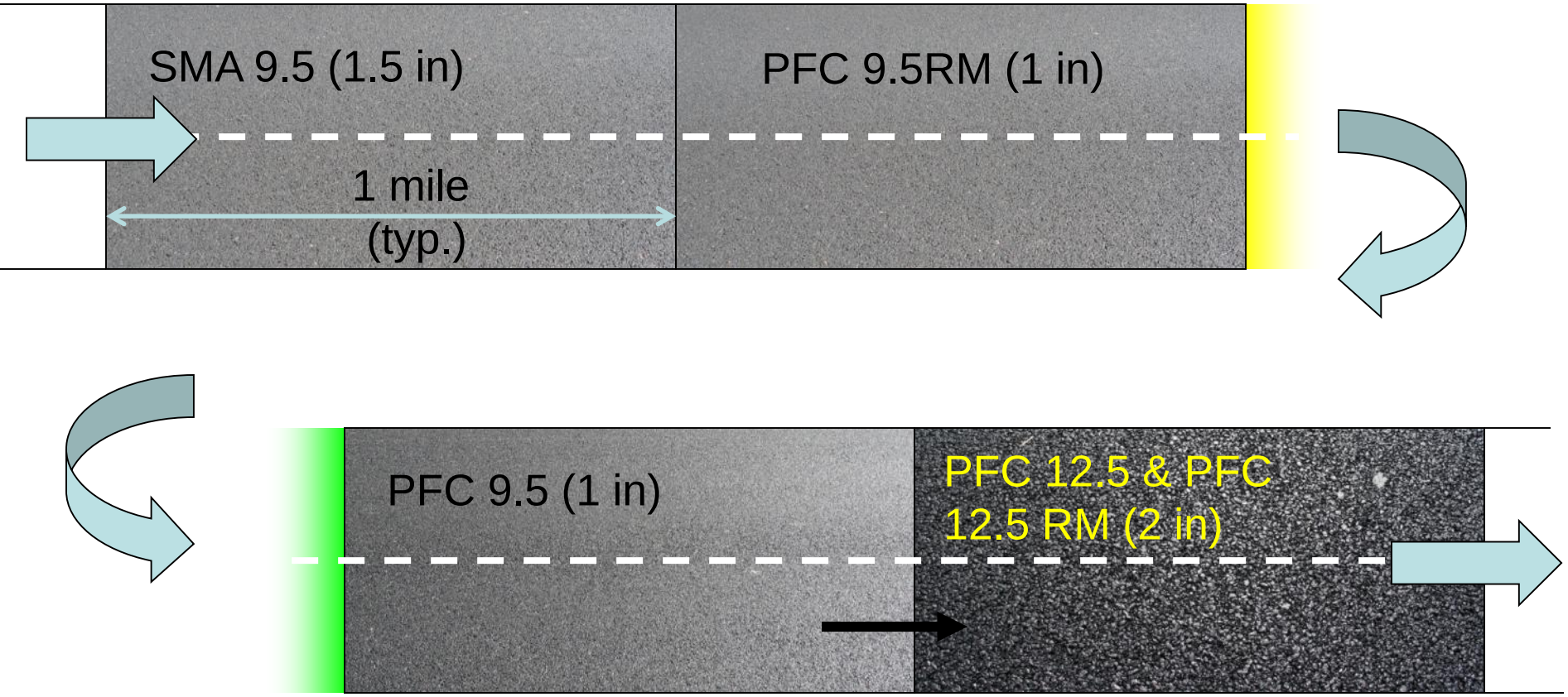
What it is:

- In General – a wearing surface that minimizes tire-pavement noise production and propagation
- Asphalt – “small-textured” porous mix (e.g., open-graded asphalt concrete)
- Concrete – negative-textured longitudinal grind and groove (e.g., “Next Generation Concrete Surface”)

What it isn’t:

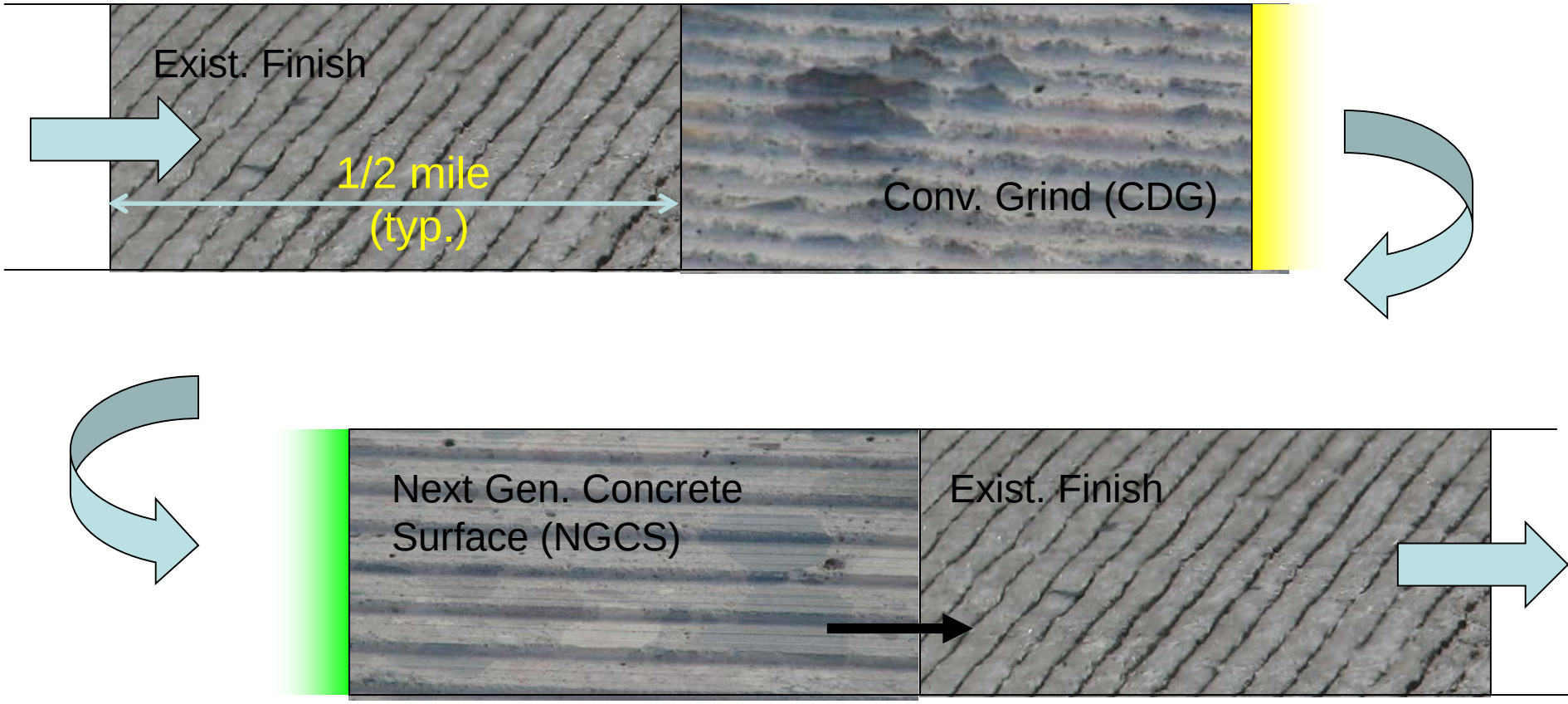
- A universal substitute for noise barriers

Asphalt Projects



Plan View

Concrete Projects



Plan View

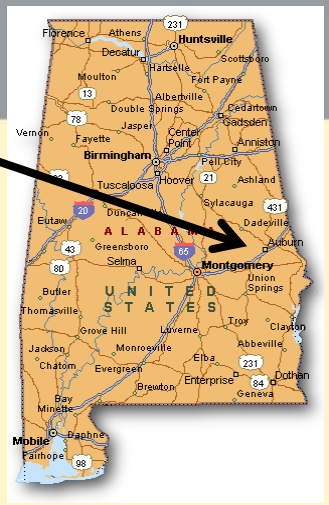
Project Selection Criteria

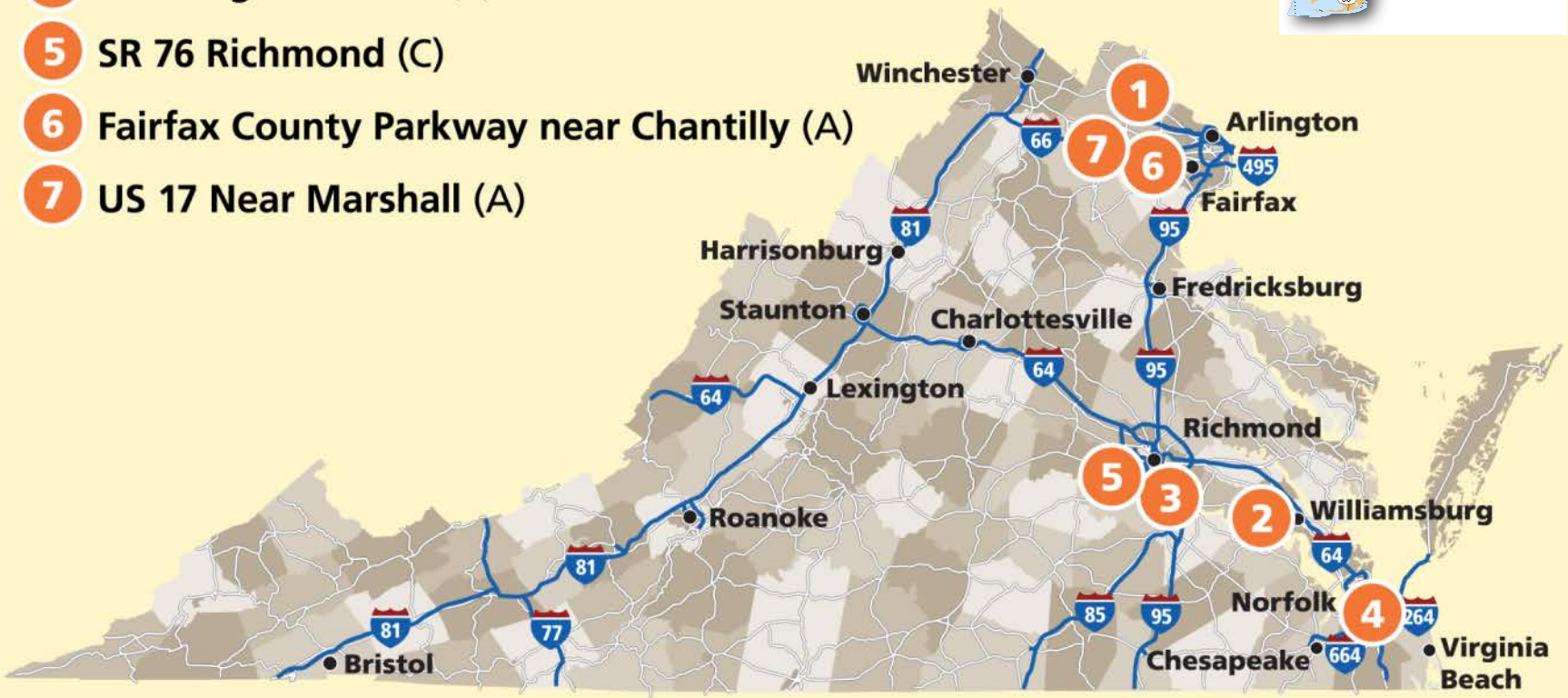
- Characteristics that support tire-pavement noise as predominant traffic noise contributor
  - Higher speeds
  - Free flowing
  - Lower to limited access

Demonstration Projects 2011/12

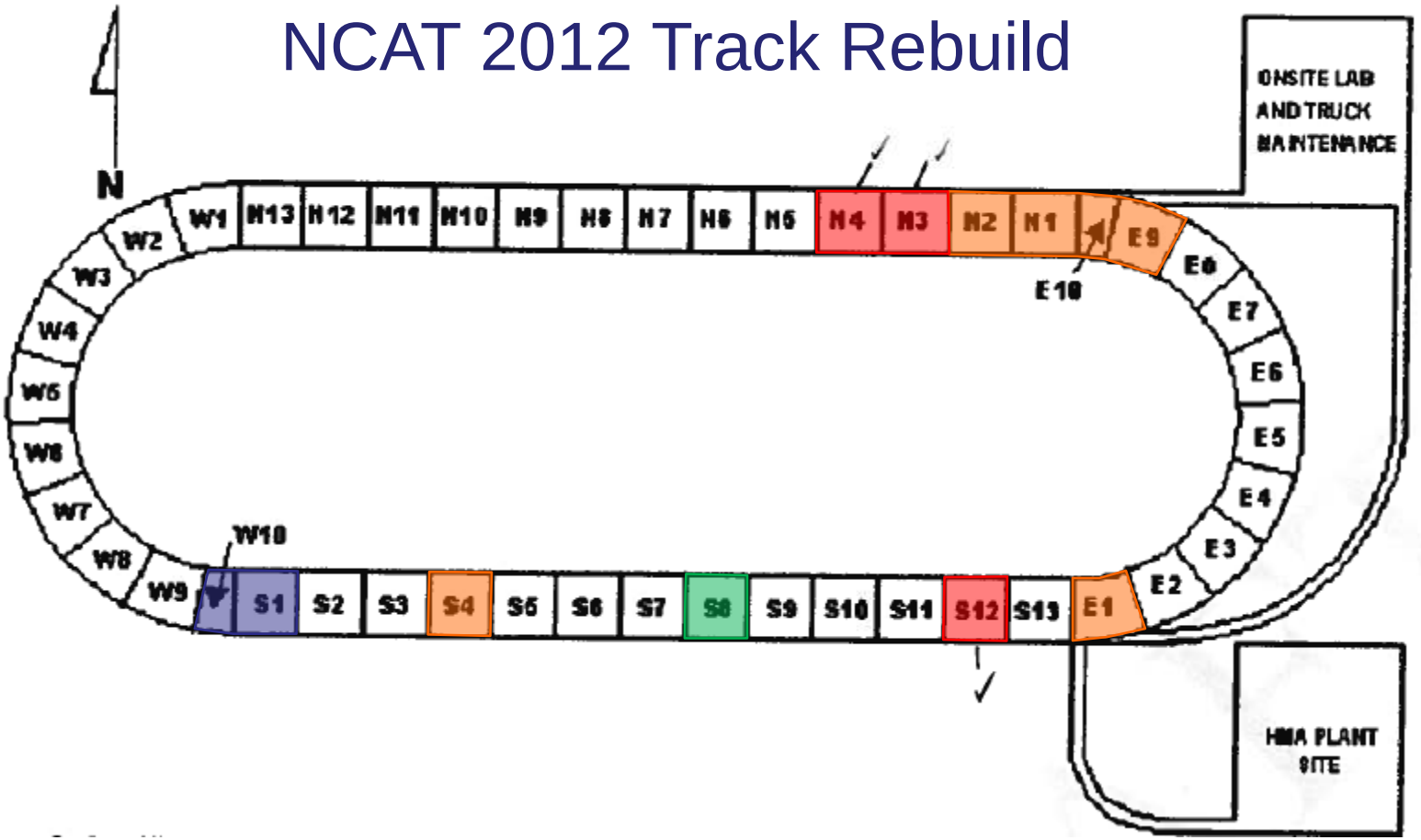
1. SR 7 By-Pass in Leesburg (A)
2. SR199 west of Williamsburg (A)
3. SR 288 near Chester (A)
4. I-64 Virginia Beach (C)
5. SR 76 Richmond (C)
6. Fairfax County Parkway near Chantilly (A)
7. US 17 Near Marshall (A)

8 NCAT





NCAT 2012 Track Rebuild



- 2012 Virginia PFC

- 2012 Other PFC

- 2012 Virginia SMA/DGA/Recycle

- 2009 Other PFC

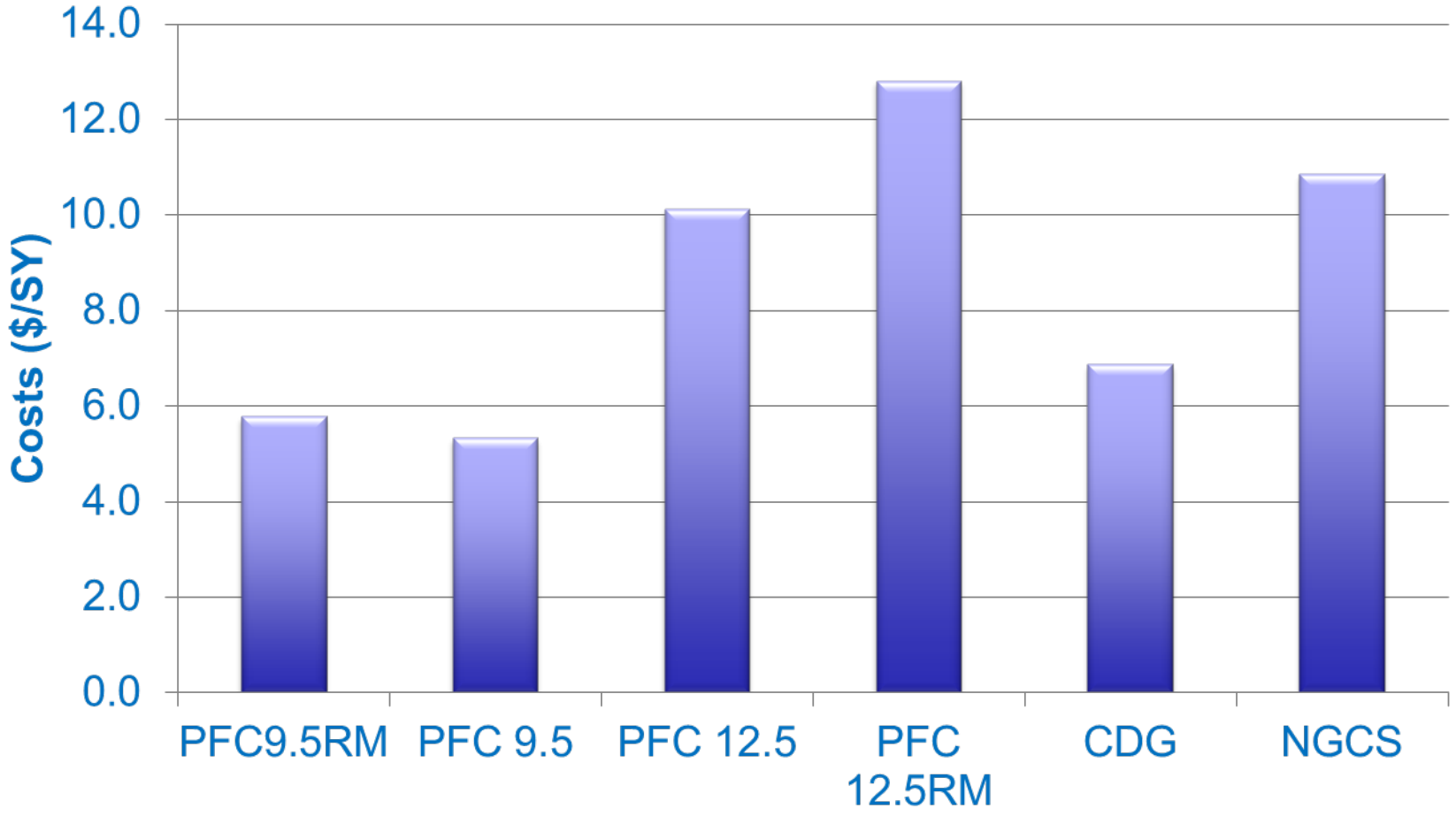
Functional Evaluation

Friction – GripTester

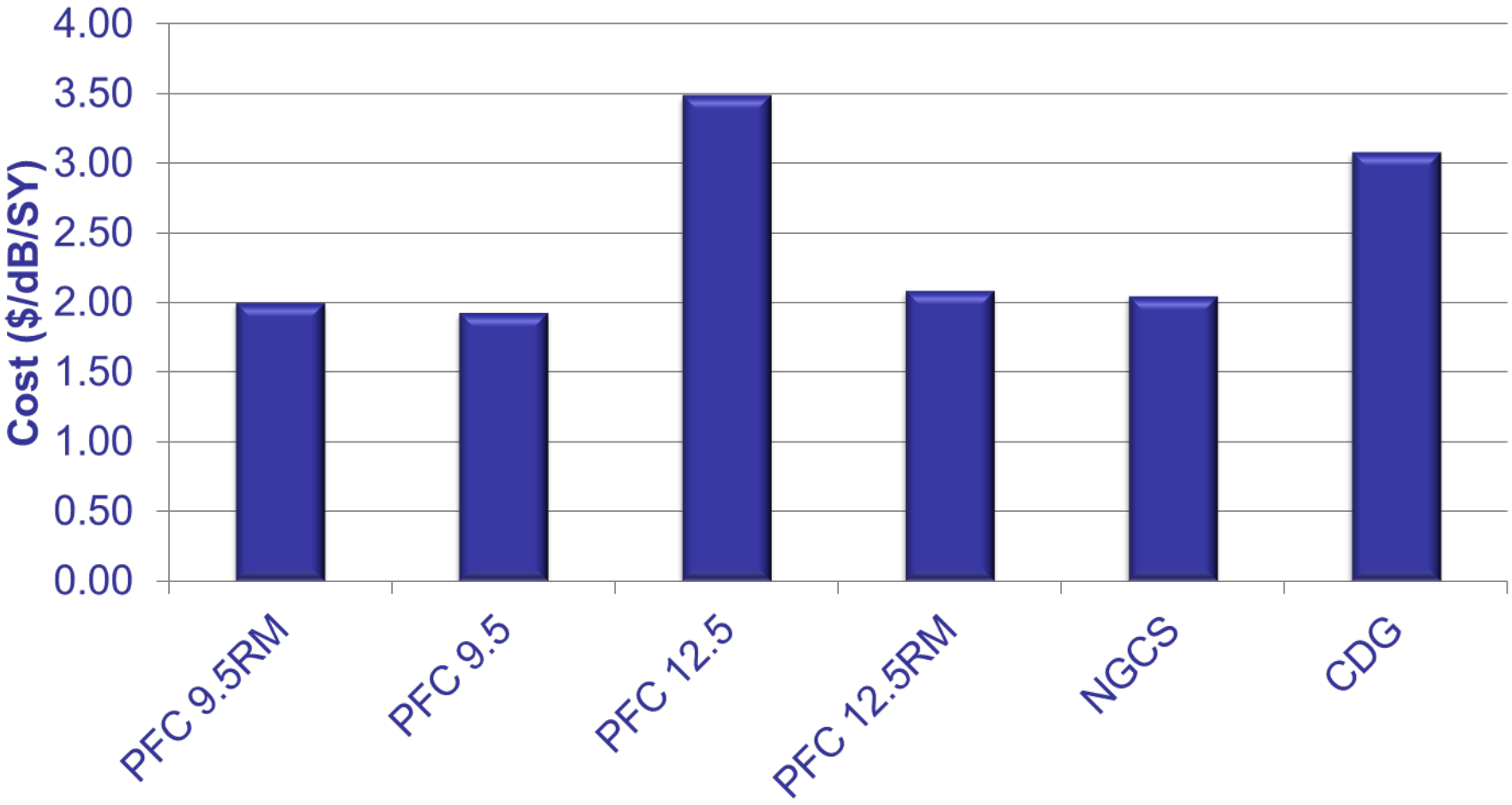
Tire-Pavement Noise (OBSI)

Ride Quality – Wide-footprint Profiler

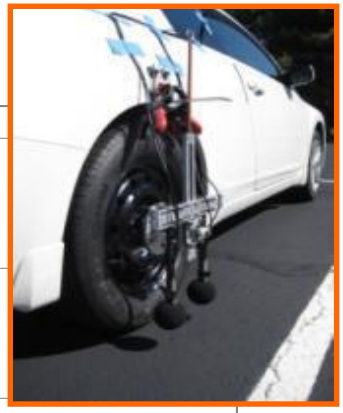
QP Technology – Initial Additional Costs



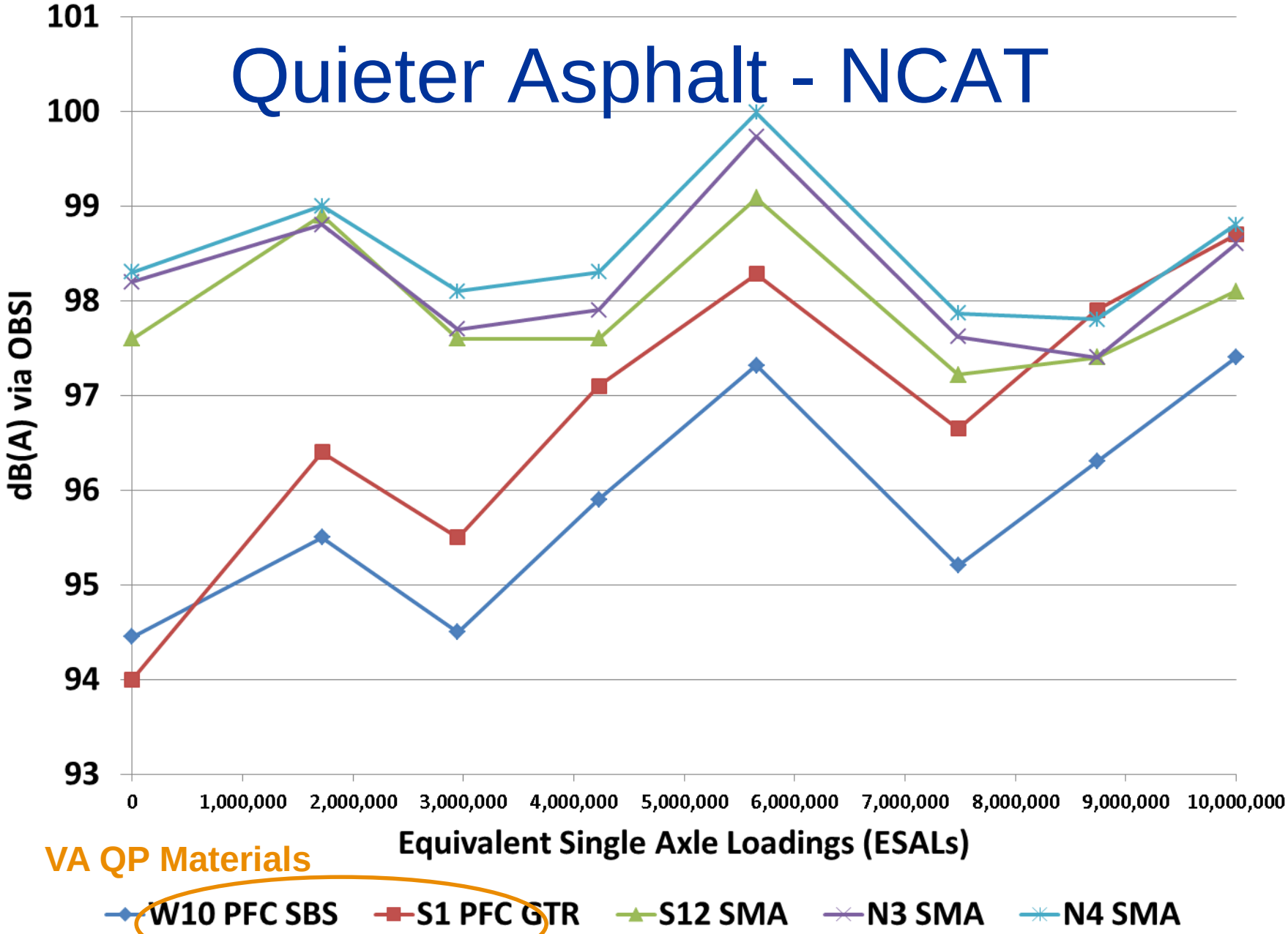
Effectiveness
(Initial Noise Reduction)



Quieter Asphalt - VA

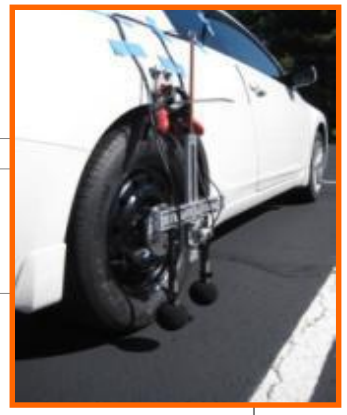


Quieter Asphalt - NCAT



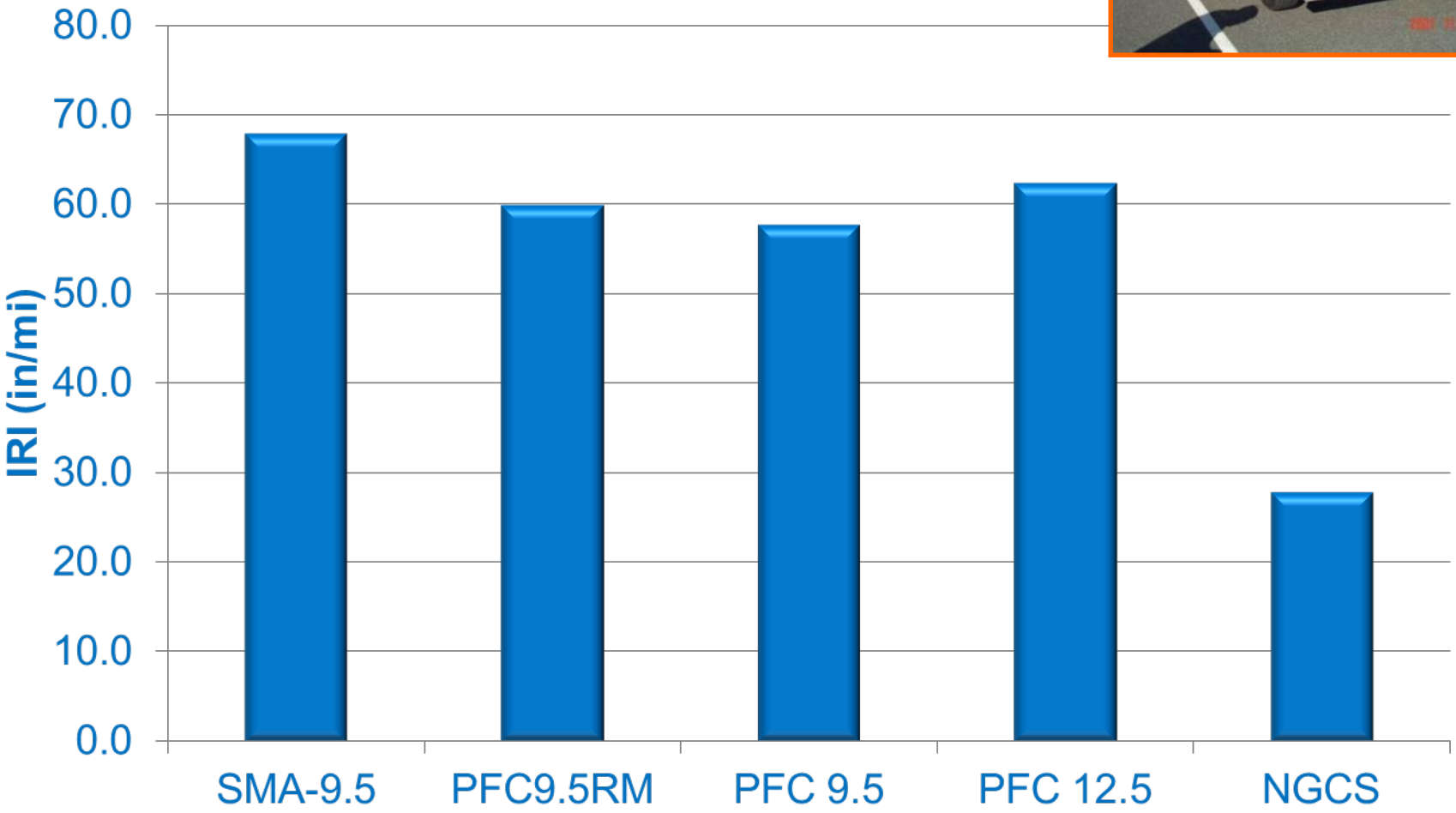
VA QP Materials

Quieter Concrete - VA



Ride Quality

Inertial Profiler



User Cost Savings – Case Study

2011 Demo Site 3	
"Control" IRI	74 in/mi
QP IRI	62 in/mi

QP Costs (per 2-lane mile)	
Most Expensive (QP1)	$ 180,224
Least Expensive (QP2)	$ 73,498

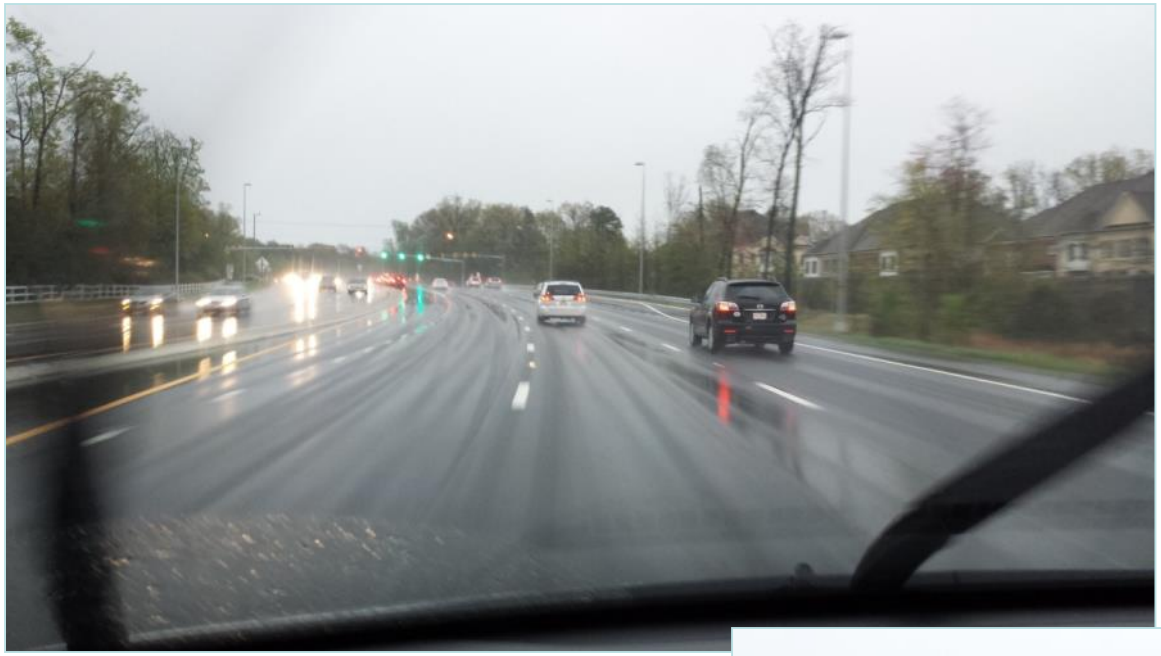
QP 2

QP 1

Cumulative Savings* (reduced fuel consumed)	
Year 1	$ 28,463
Year 2	$ 57,780
Year 3	$ 89,990
Year 4	$123,166
Year 5	$157,338
Year 6	$192,536
Year 7	$228,789
Year 8	$266,131
Year 9	$304,593
Year 10	$344,210

* Not Agency Savings

Quiet Pavement – Wet

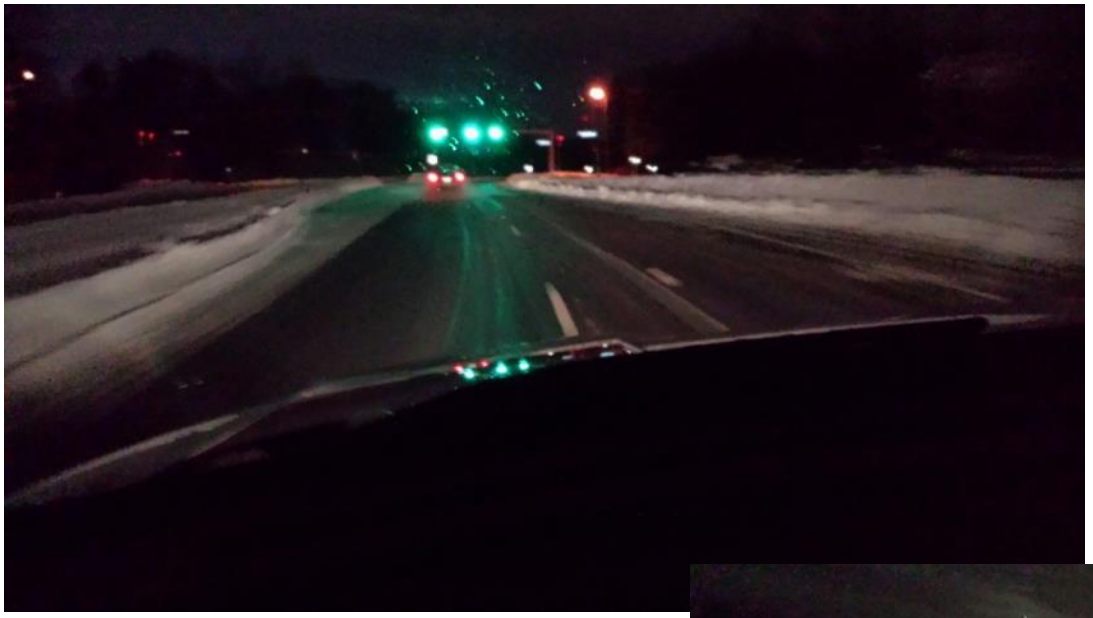


SMA

Quiet Pavement

May 2014

Quiet Pavement – Winter



Control

Quiet Pavement

Feb 2014

“Cold Start”?


Distress
triggered by
line eradication

Summary of Findings

- QP technologies provide beneficial spray reduction and improved skid resistance – wet weather.
- For asphalt QPs (PFC) - Noise reduction levels are not noticeable compared to control surfaces after 4 winters (< 2dB)
- For concrete QP (NGCS) – Noise reduction levels are noticeable compared to control after 4 winters (~5dB)
- None of the technologies provided sufficient noise reductions to singularly meet federal regulations – Minimum of 7dB for single receptor and, minimum of 5dB for at least 50% of receptors.

Consider PFC's for some traffic noise mitigation and improved wet-weather function when:

- Traditional noise barriers are not practical and/or desirable
- Tire-pavement interaction is the primary traffic noise source
- Alignment/cross-section meets Interstate-caliber geometric requirements
- Heavy winter maintenance activities are rarely necessary
  - deicing salts/brines a normal first approach
  - accumulating frozen precipitation is uncommon
- The existing pavement is structurally sufficient or will be made so

Site Selection:

- “Spot” applications are strongly discouraged. Establish natural project limits with uniformity for maintenance and use (under any weather conditions)
- Avoid facilities with poor geometrics

Construction considerations:

- Use very heavy tack-coat
- Make sure lay-down equipment is well heated – “waste” first load after passing through the material transfer vehicles (MTVs).
- Always “daylight”. Beware adjacent dense-graded shoulders, turn-lanes, or wide cross-overs.

Winter Maintenance!!:

- PFC surfaces require careful and constant monitoring during any winter event
- Higher levels of salt and liquid anti-icing materials will be necessary (magnesium chloride solutions have proven effective)
- Use of abrasives will reduce porosity and substantially reduce functional service life

For more information:

Kevin.McGhee@vdot.virginia.gov

Links to Interim Report to Virginia General Assembly:
http://leg2.state.va.us/dls/h&sdocs.nsf/0/e0a4b50ad340248c8525787e0057d09a?OpenDocument

http://www.virginiadot.org/VDOT/Projects/asset_upload_file884_5721.pdf

Final Legislative Report – Soon!