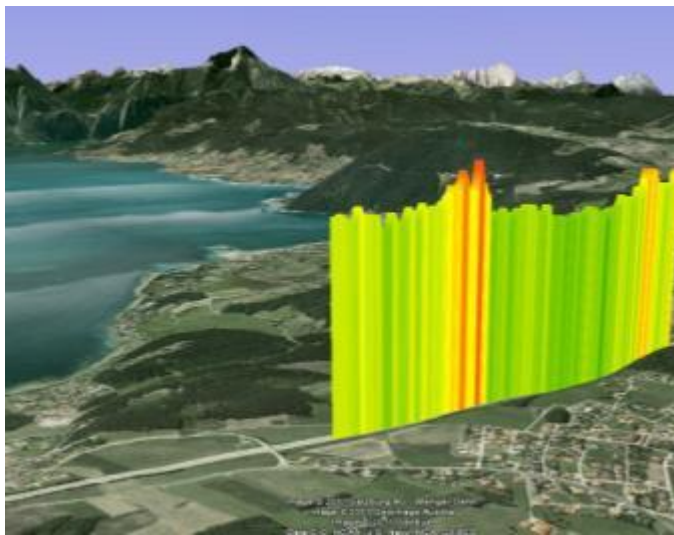




Texture, Surface Characteristics, and Functional Performance



29 August 2012

Robert Otto Rasmussen, PhD, INCE, PE



Functional Pavement Performance

- Smoothness

- Friction

- Noise

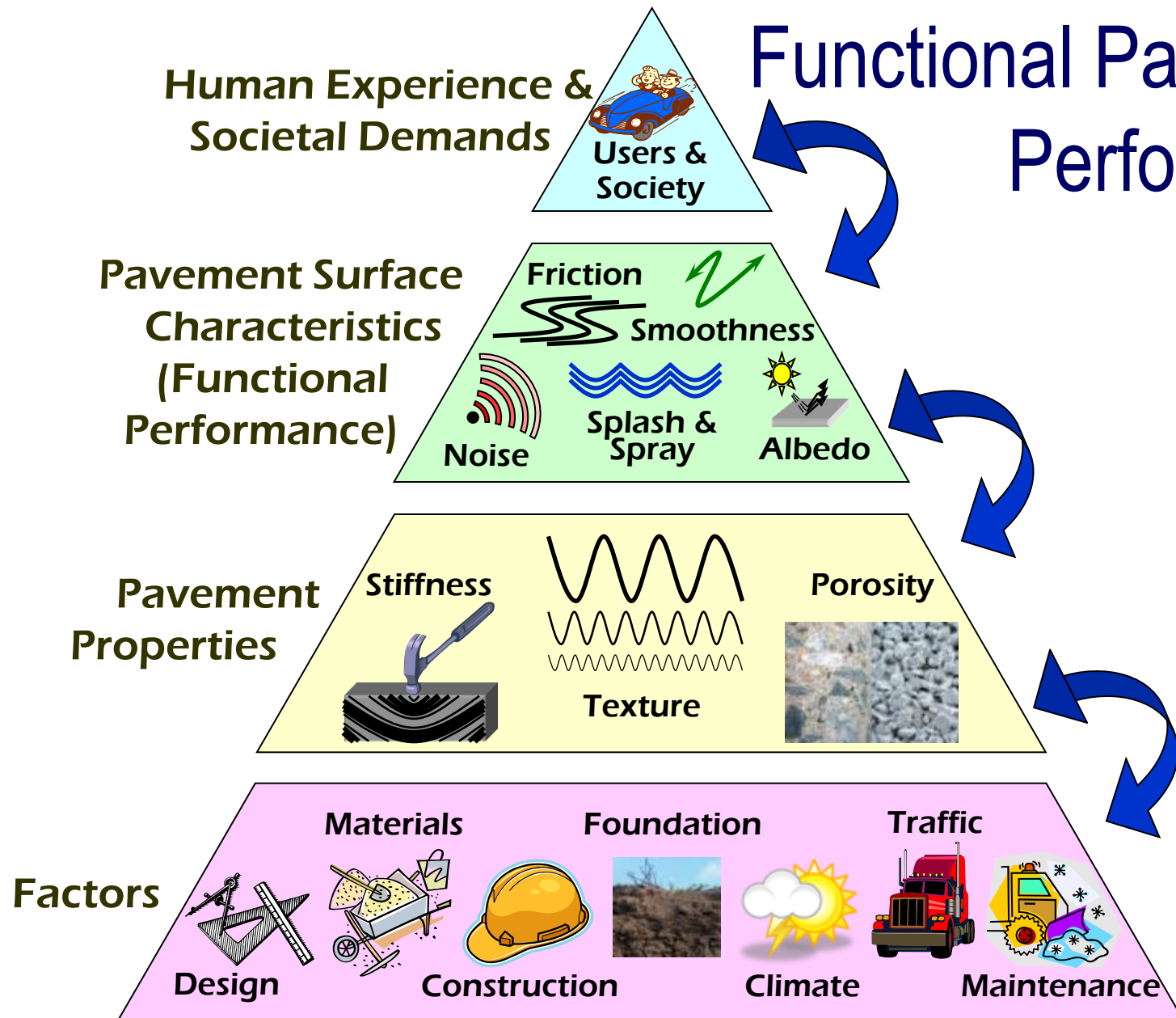
- Rolling Resistance

- Splash & Spray

- Vehicle Wear

- Tire Wear

Functional Pavement Performance



Texture



Texture

Roughness



Megatexture



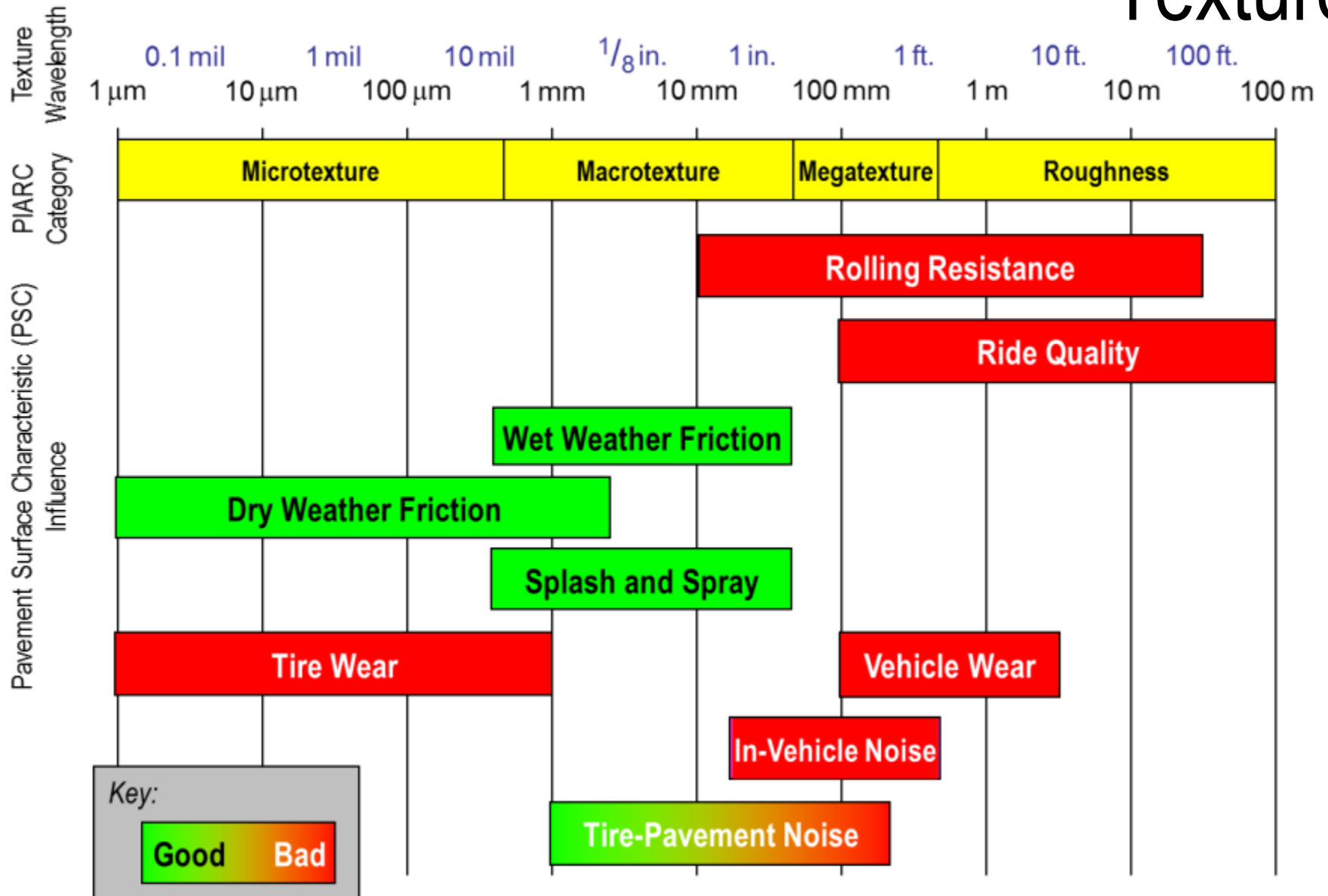
Macrotexture



Microtexture



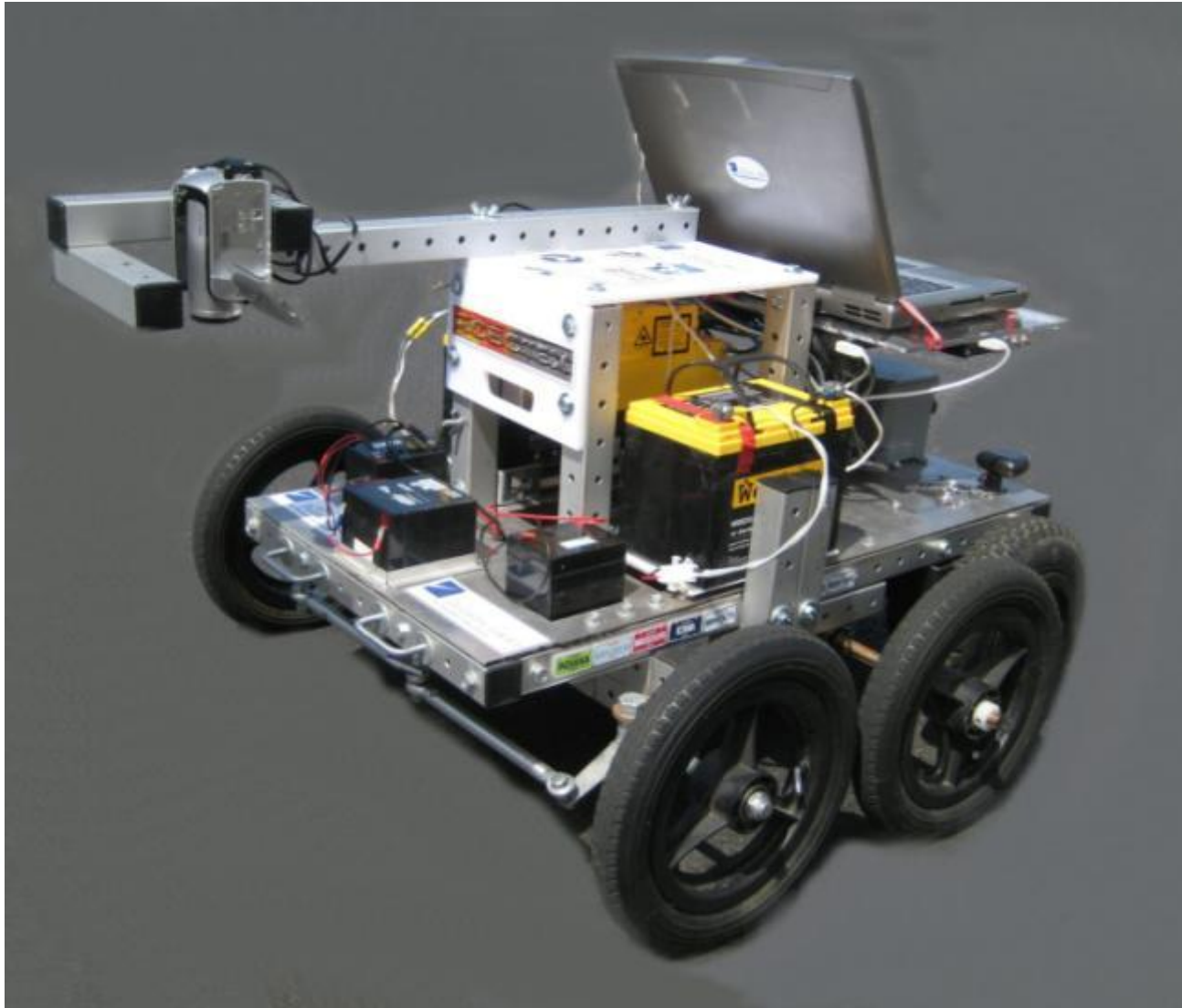
Texture



Texture: “Sand” Patch

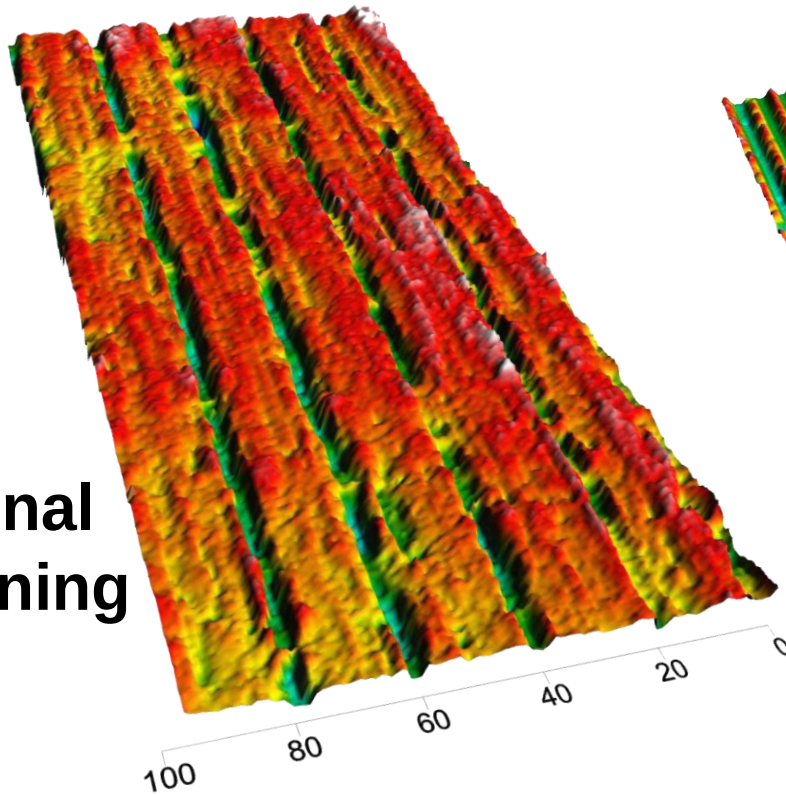


Texture: RoboTex

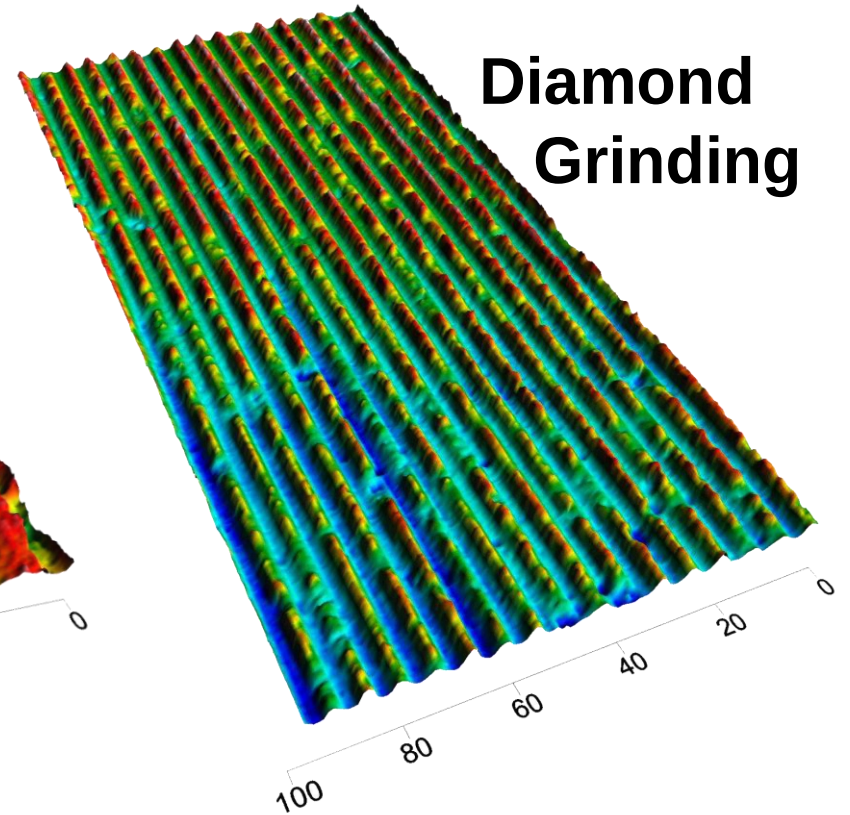


Texture: RoboTex

**Longitudinal
Tining**



**Diamond
Grinding**



Texture: RoboTex



Surface Characteristics



Noise: On-Board Sound Intensity (OBSI)

AASHTO TP 76



Noise: On-Board Sound Intensity (OBSI)



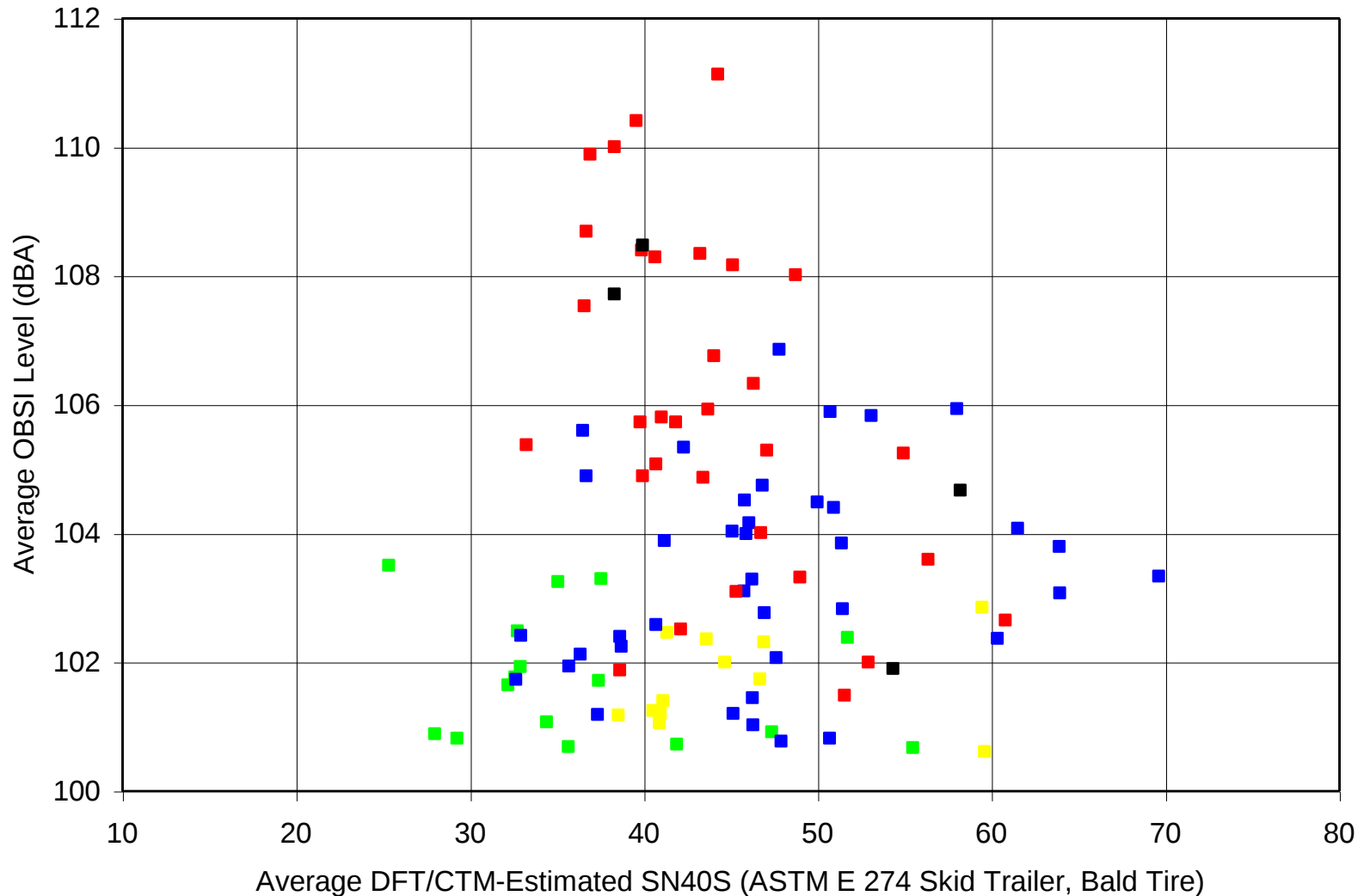
Friction

ASTM E 274



Photo: Ministry of Transportation Ontario

Do Friction and Noise Relate?



Rolling Resistance



COOEE / MnROAD / MIRIAM

Variability



Variability

■ In 8 years, 2000 unique textures have been tested

■ Concrete

- Tined, Diamond Ground and Grooved, Drag
- Exposed Aggregate
- Pervious

■ Asphalt

- Dense-Graded
- SMA
- Porous

■ Surface Treatments

- Bonded Wearing Courses
- Slurry Seals
- Chip Seals
- Shot Peened
- Milled

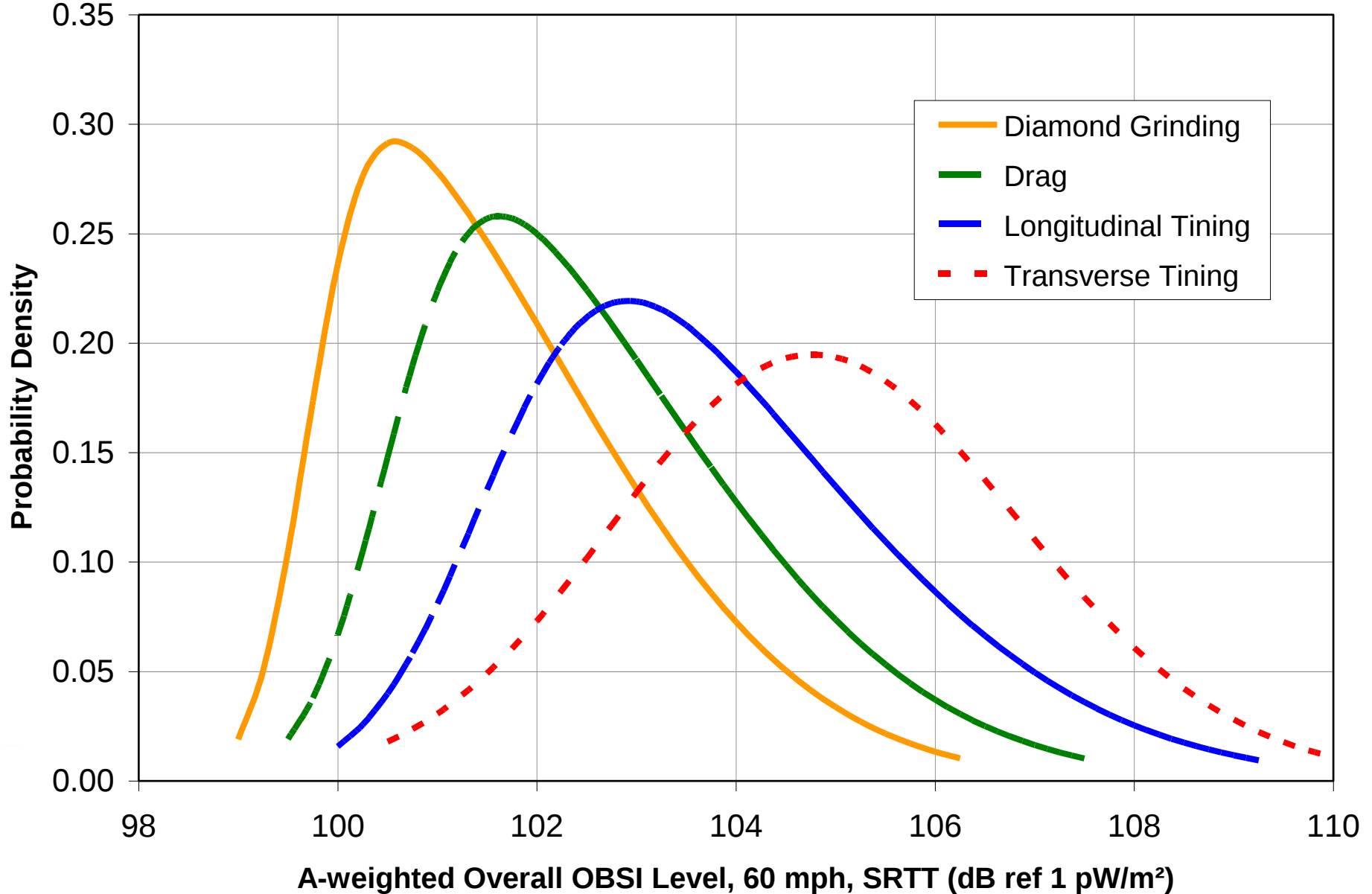
■ Hundreds of miles in 20 States and 7 Countries

There is a lot of:

VARIABILITY

**Variability from project to project, and
variability within a given project.**

Variability: OBSI Noise Catalog



Diamond Grinding

98 dBA
Kansas



98 dBA
Colorado



101 dBA
Minnesota



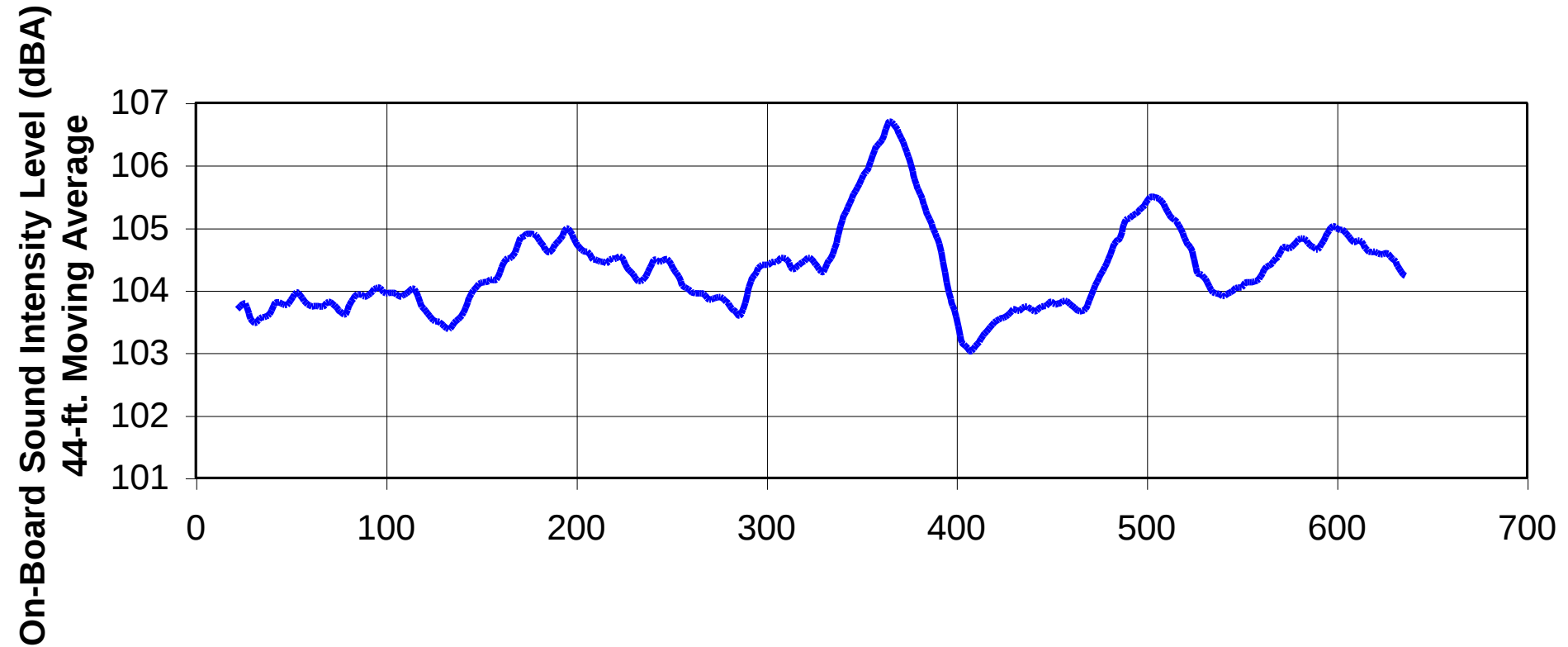
104 dBA
New York

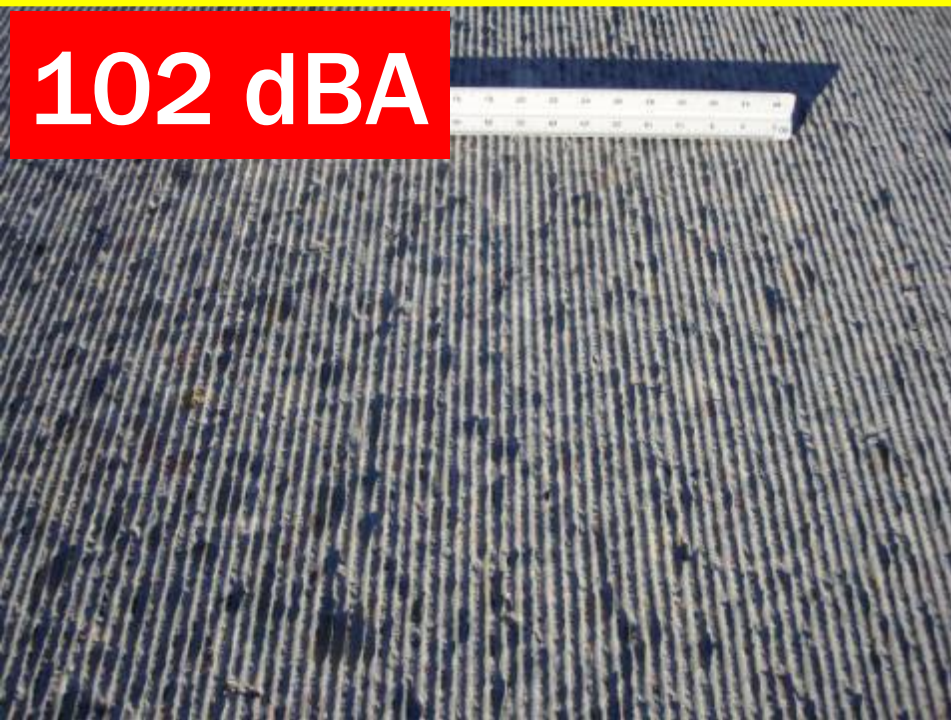
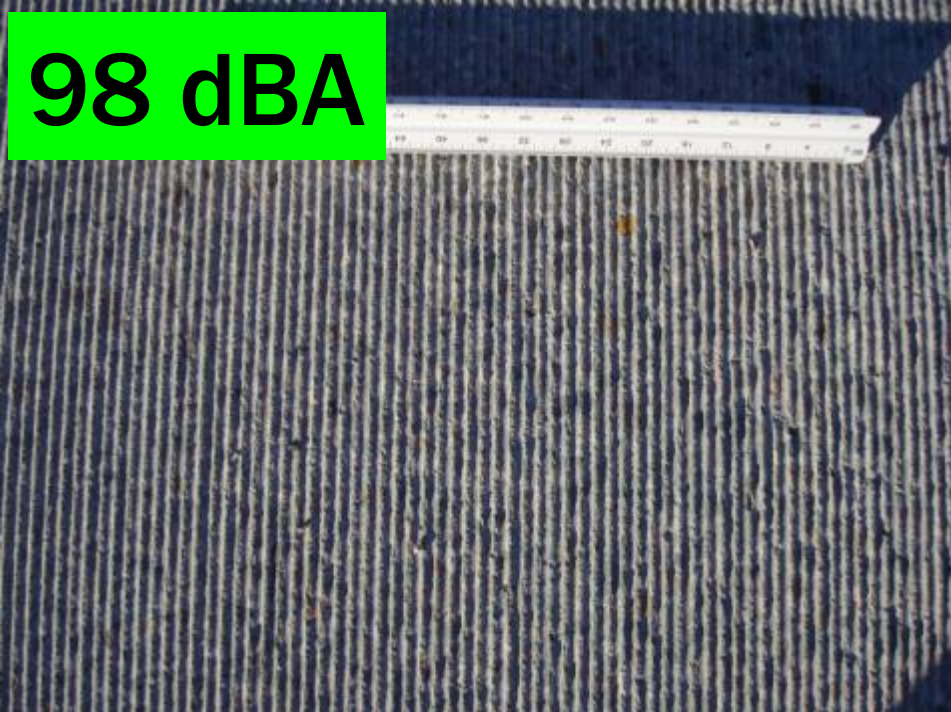


Variability: Diamond Grinding

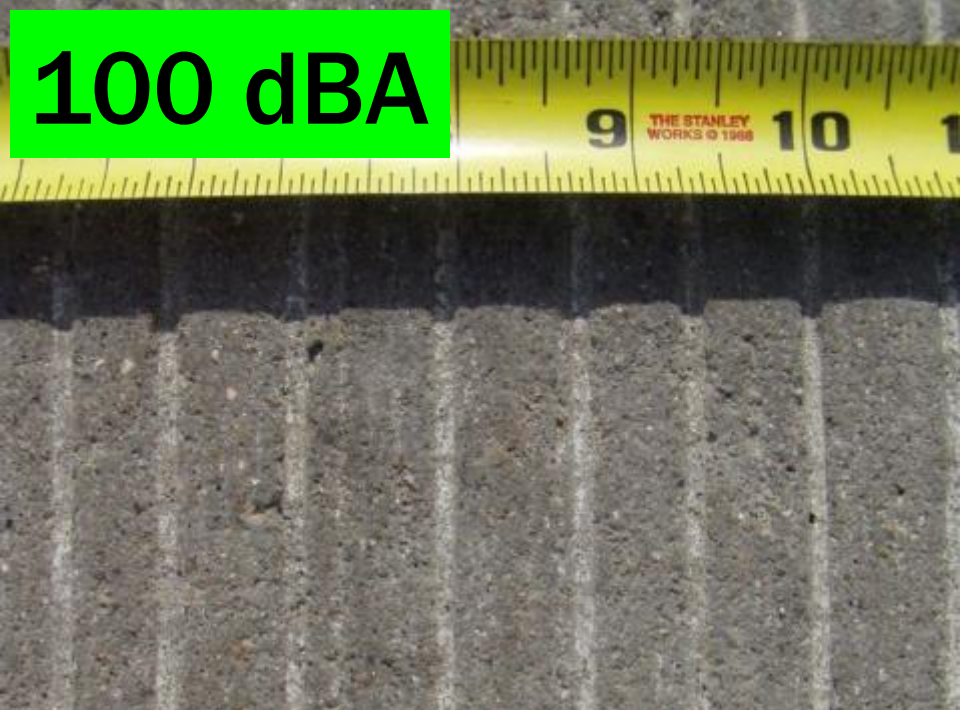


Variability within a Job





100 dBA



106 dBA





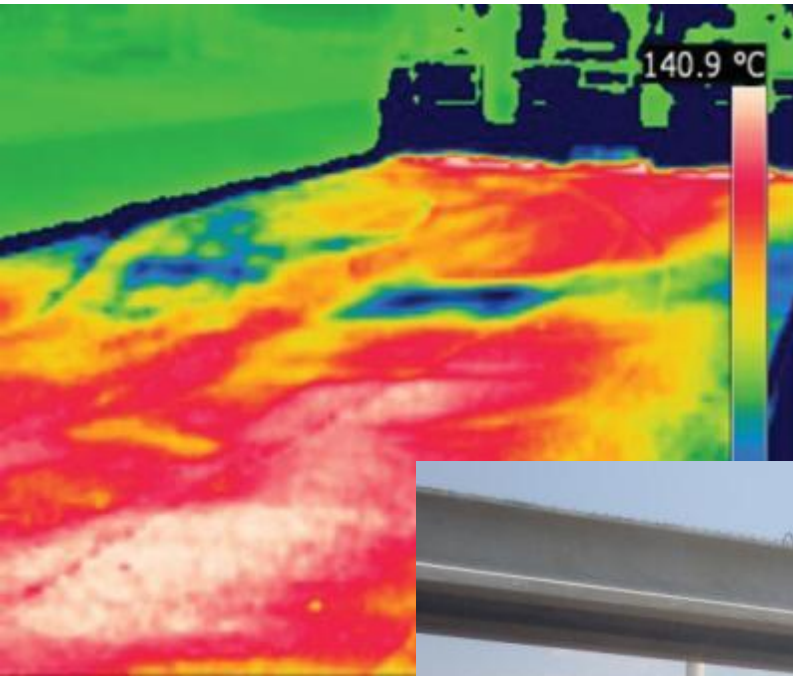
Laydown



Compaction



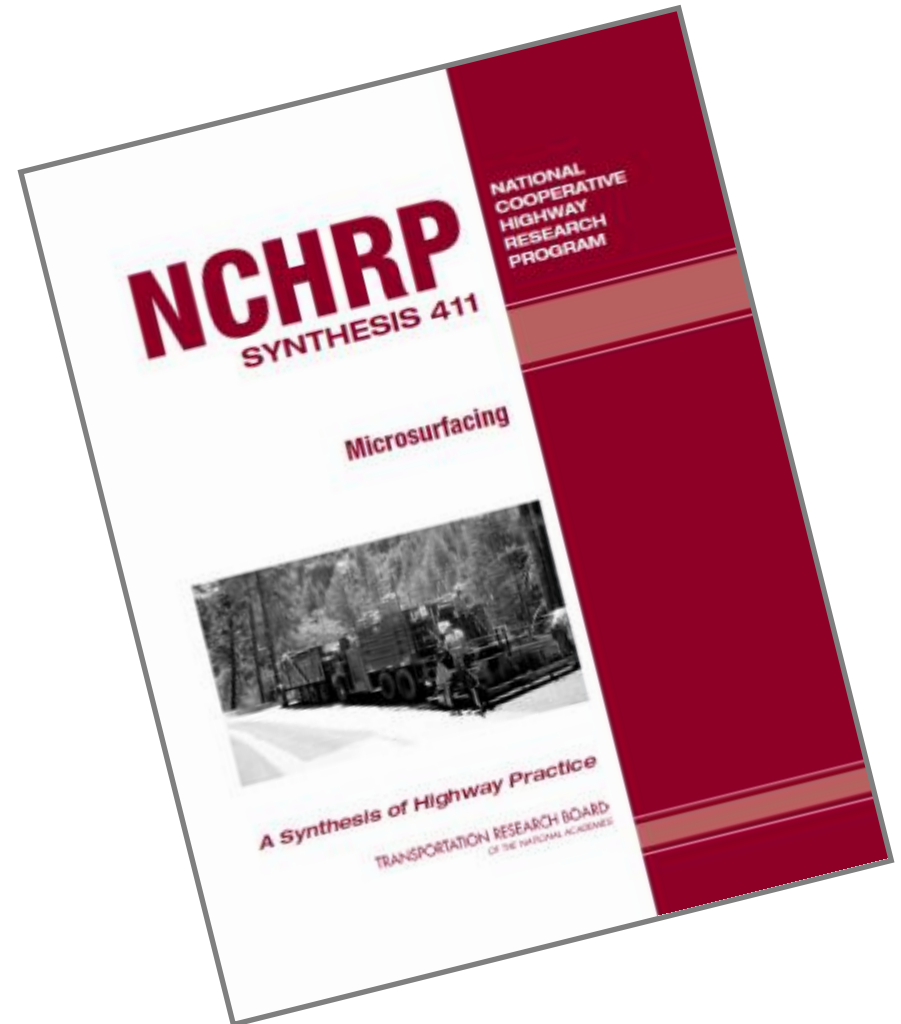
Variability: Asphalt Pavement



Better Practices and Quality Control



Design, Construction, Preservation Guidelines



www.CPTechCenter.org

www.TRB.org

www.PavementPreservation.org

Real-Time Monitoring

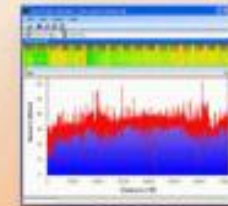
SHRP 2 R06(E)
Real-Time
Smoothness for
Concrete Paving



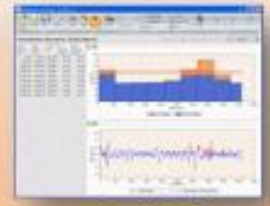
Real-Time Monitoring



FUTURE
LOOK

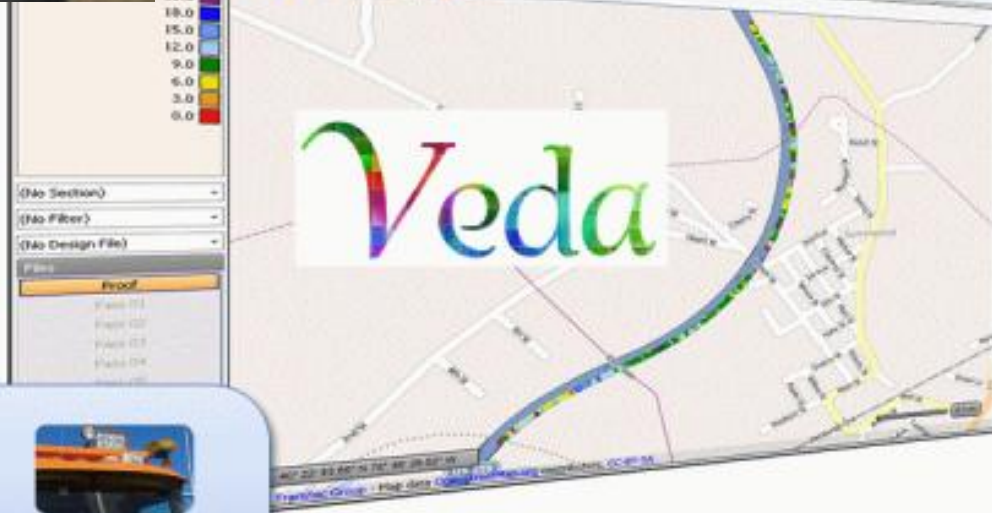


MOBA
Thermal Bars



ProVAL
Smoothness

NOW
MON



Intelligent
Compaction

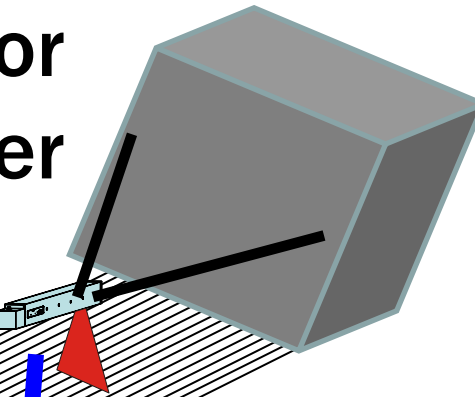
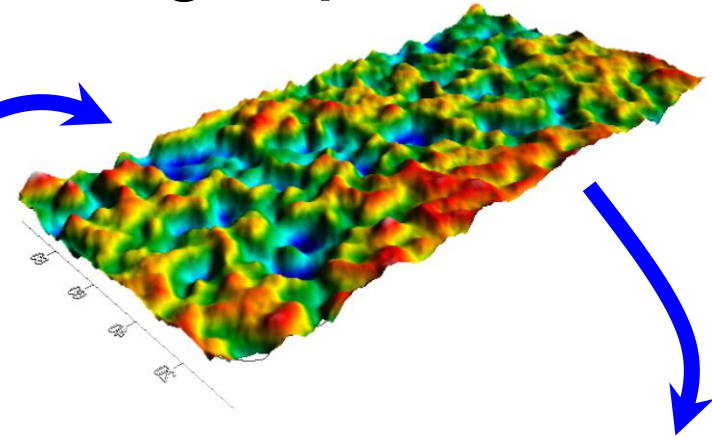


Sonic
Test Rolling

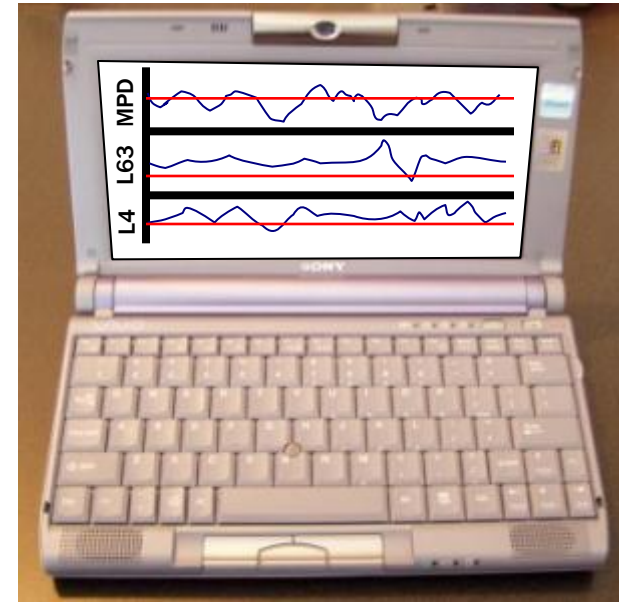
www.IntelligentCompaction.com

Monitor Texturing Operations

**Texture Machine,
Grinder, or
Roller**



LMI RoLine
Line Laser

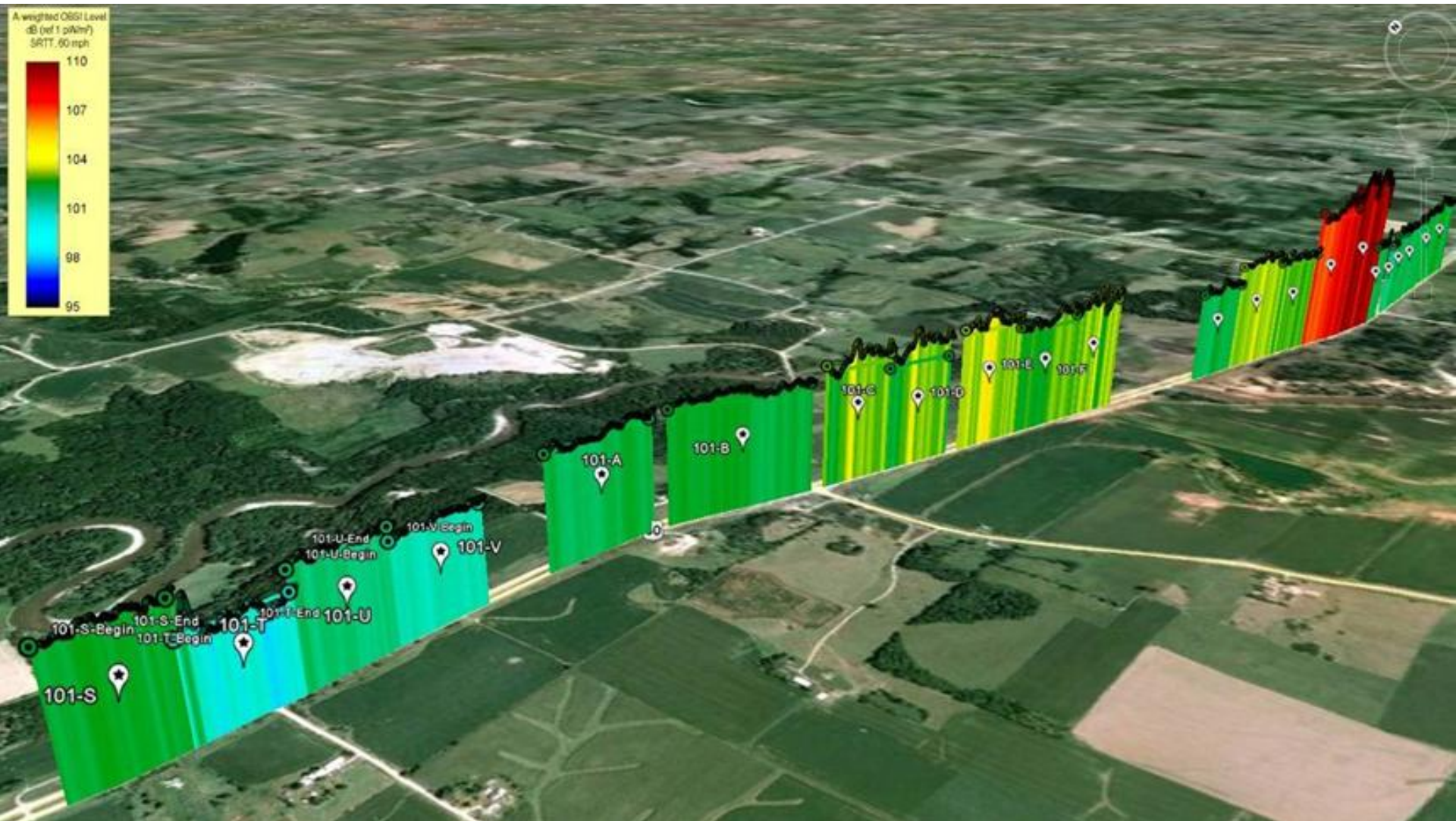


**Texture and Vibration
Feedback**

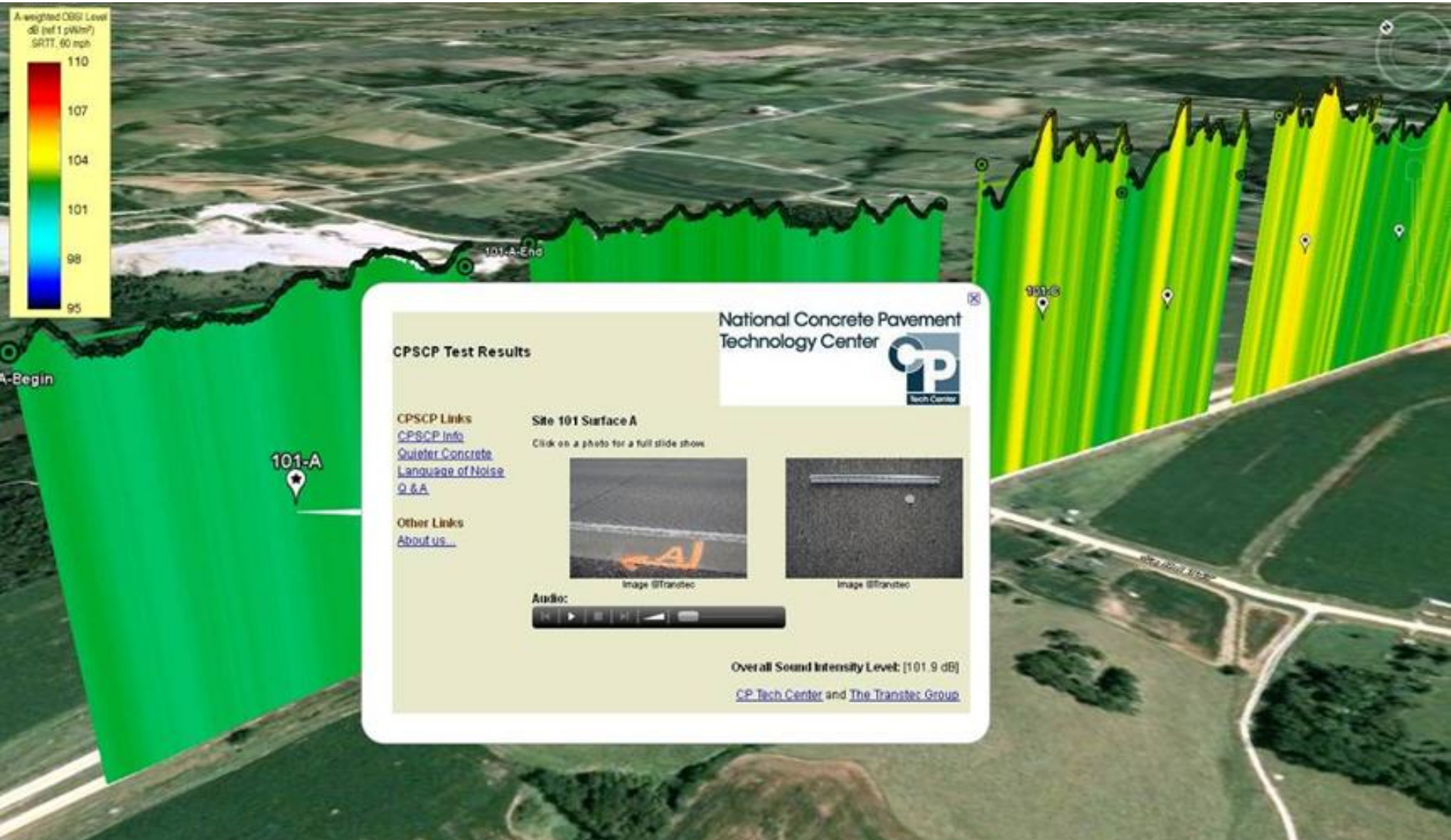
Visualization and Network Evaluation



Visualization



Visualization



Visualization

National Concrete Pavement Technology Center

CPSCP Test Results

CPSCP Links

- [CPSCP Info](#)
- [Quieter Concrete](#)
- [Language of Noise](#)
- [Q & A](#)

Other Links

- [About us...](#)

Site 101 Surface A

Click on a photo for a full slide show.

Image ©Transtec

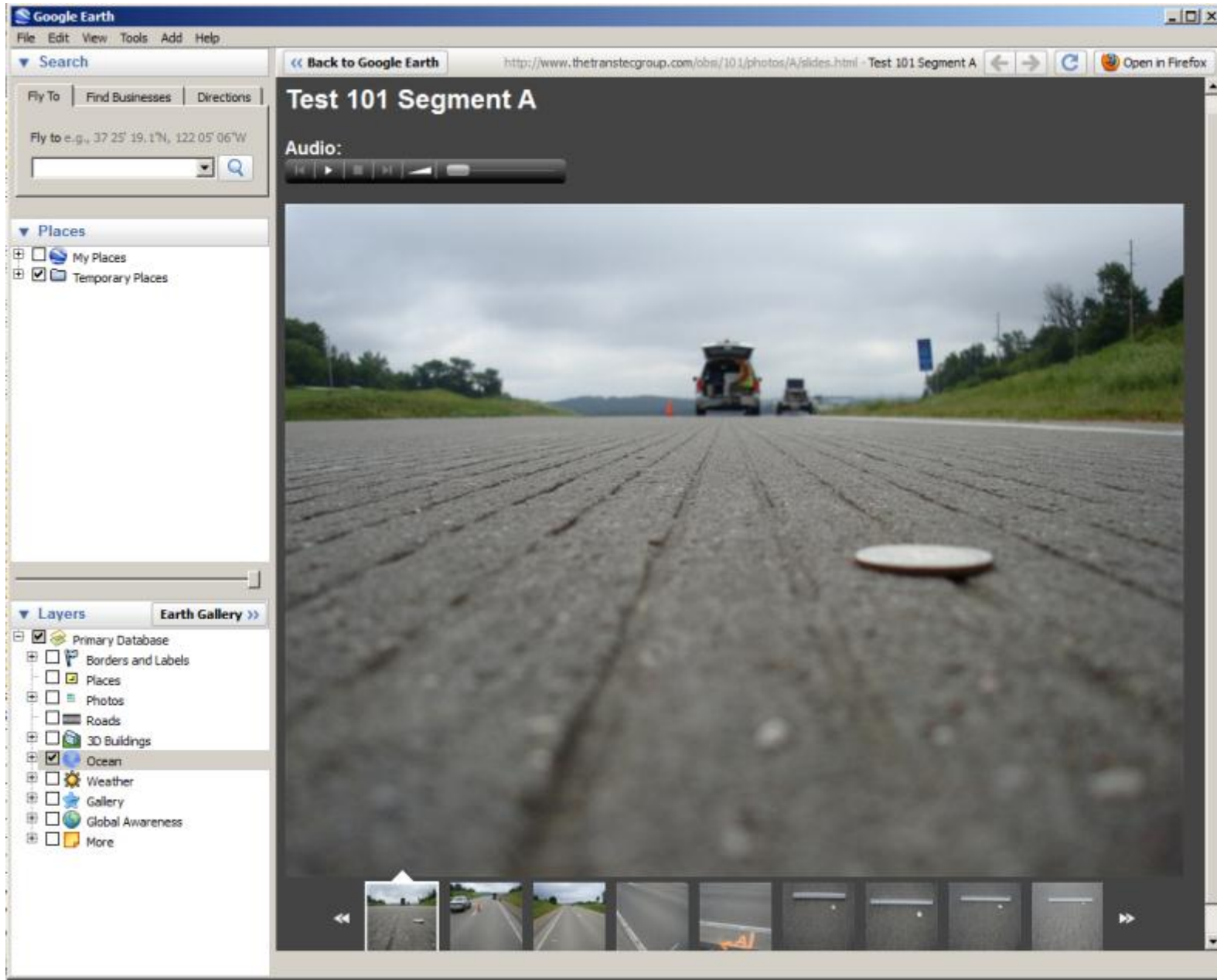
Image ©Transtec

Audio:

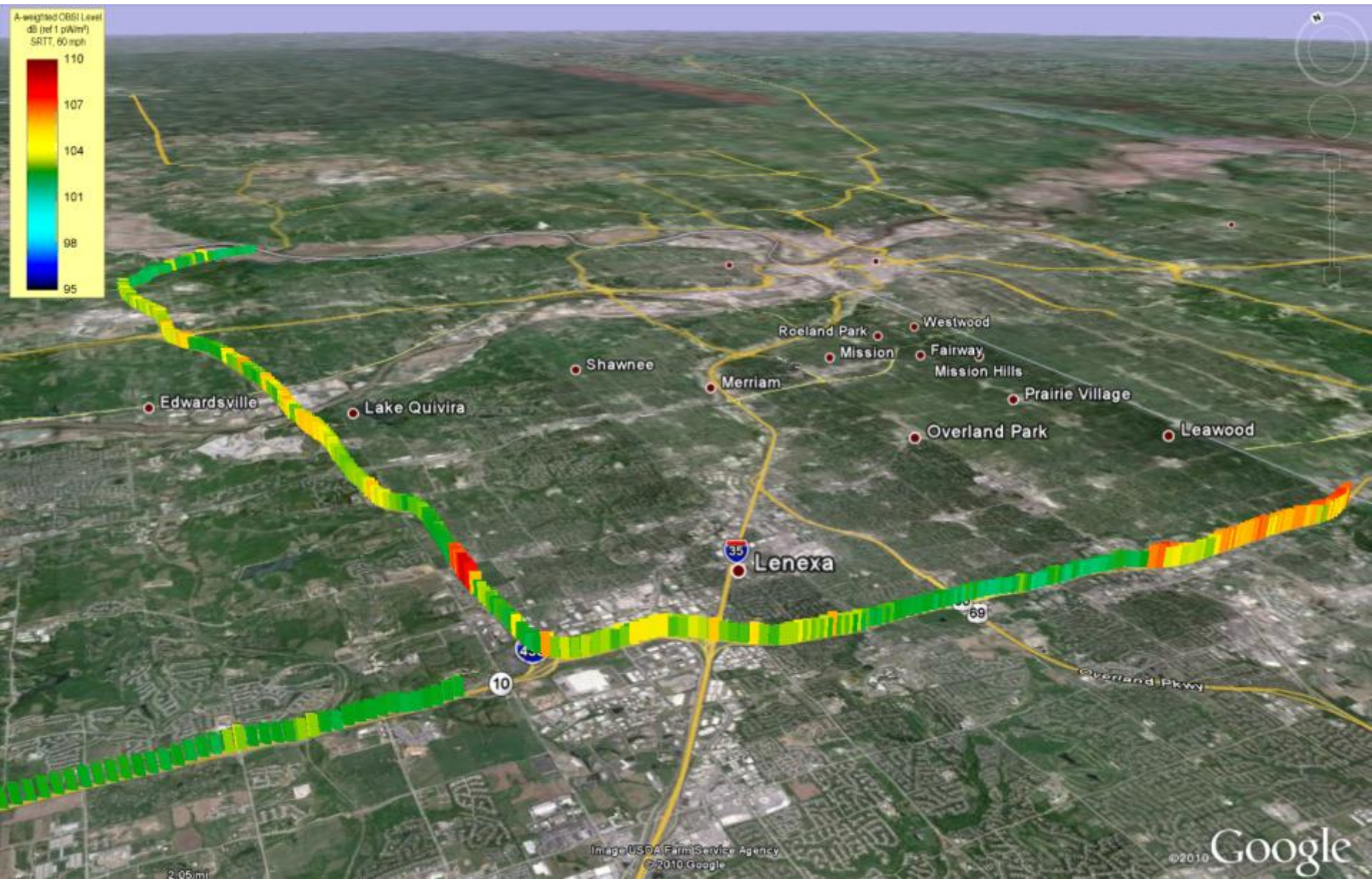
Overall Sound Intensity Level: [101.9 dB]

[CP Tech Center](#) and [The Transtec Group](#)

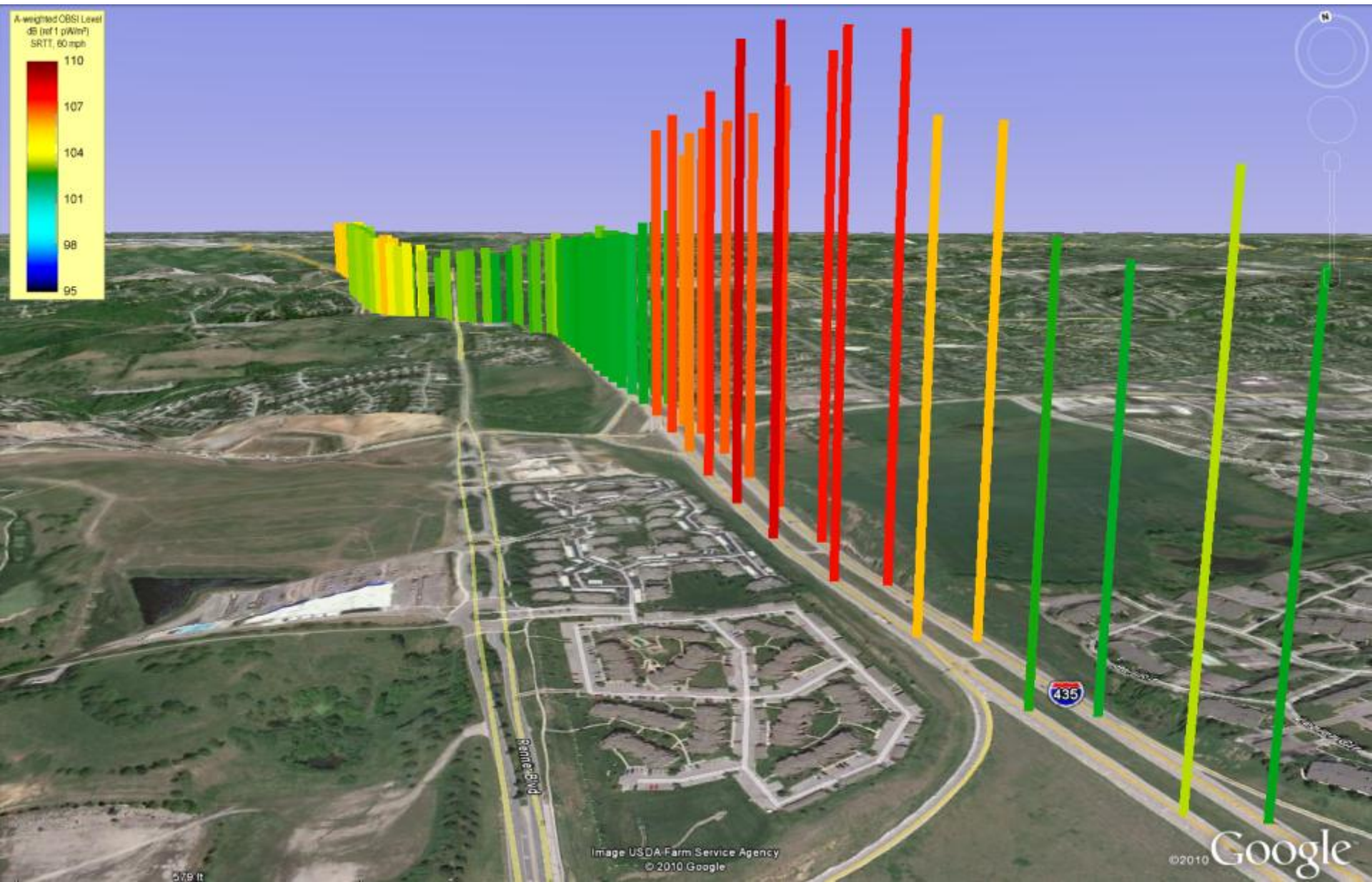
Visualization



Visualization



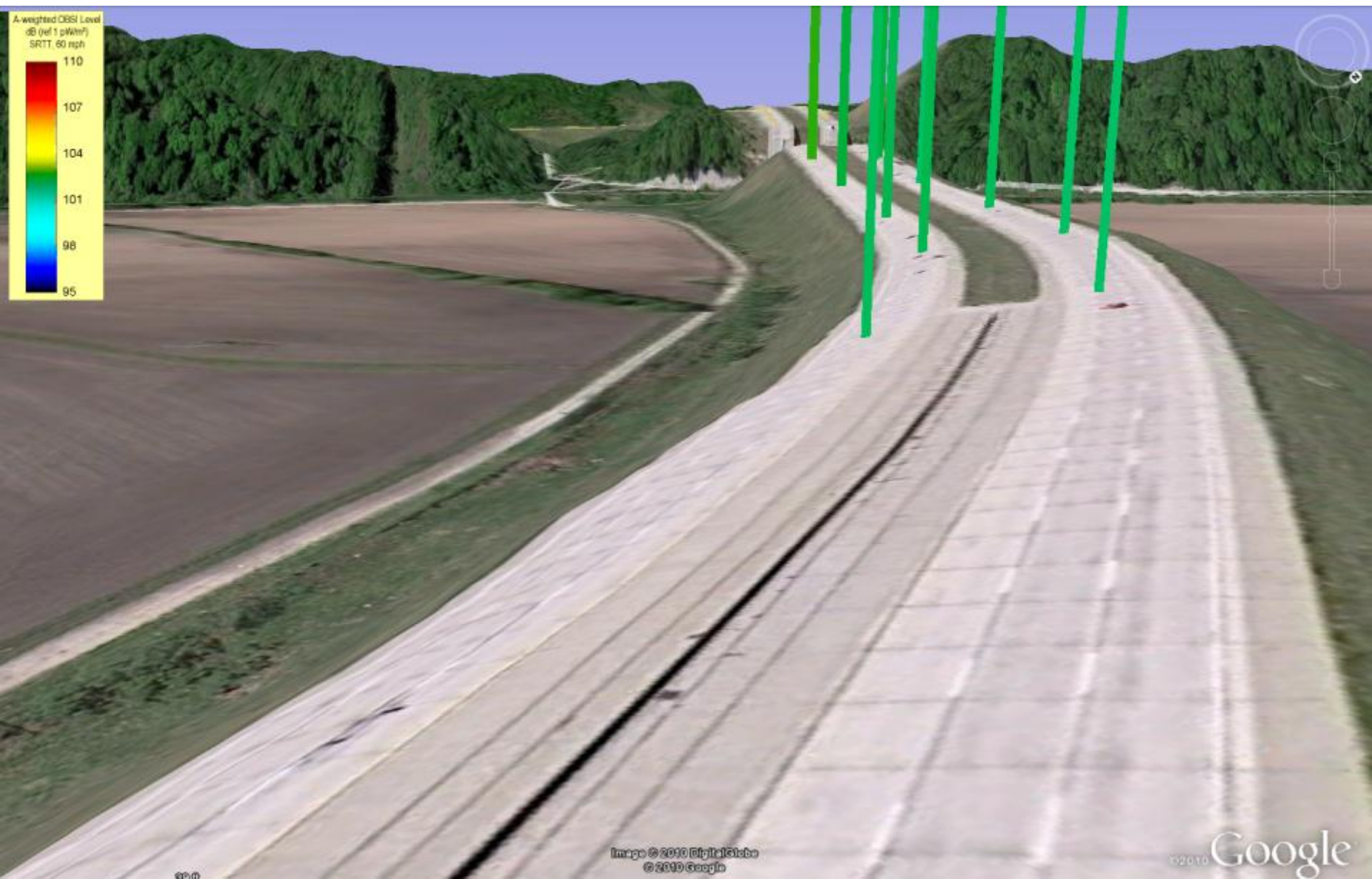
Visualization



Visualization



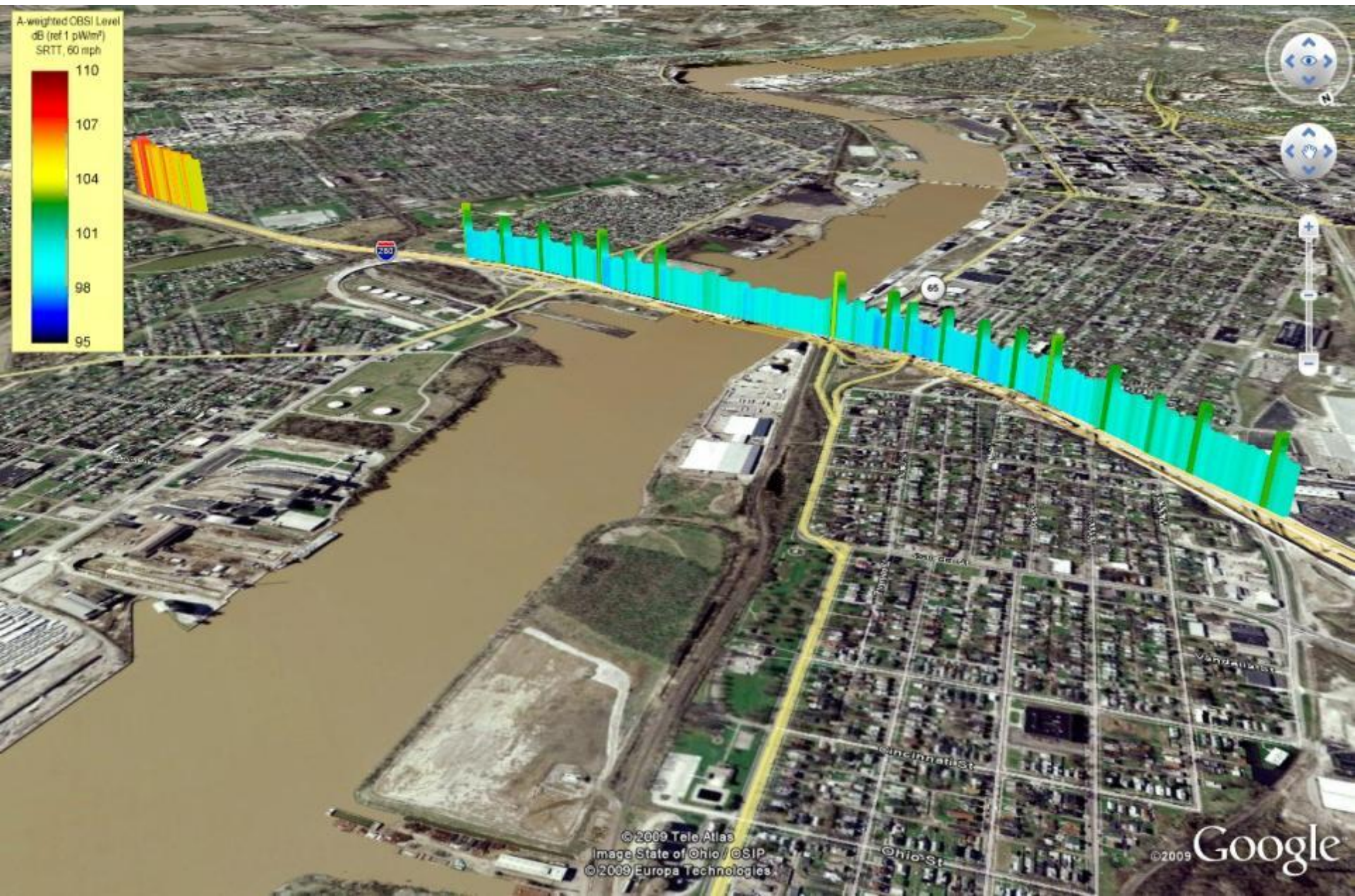
Visualization



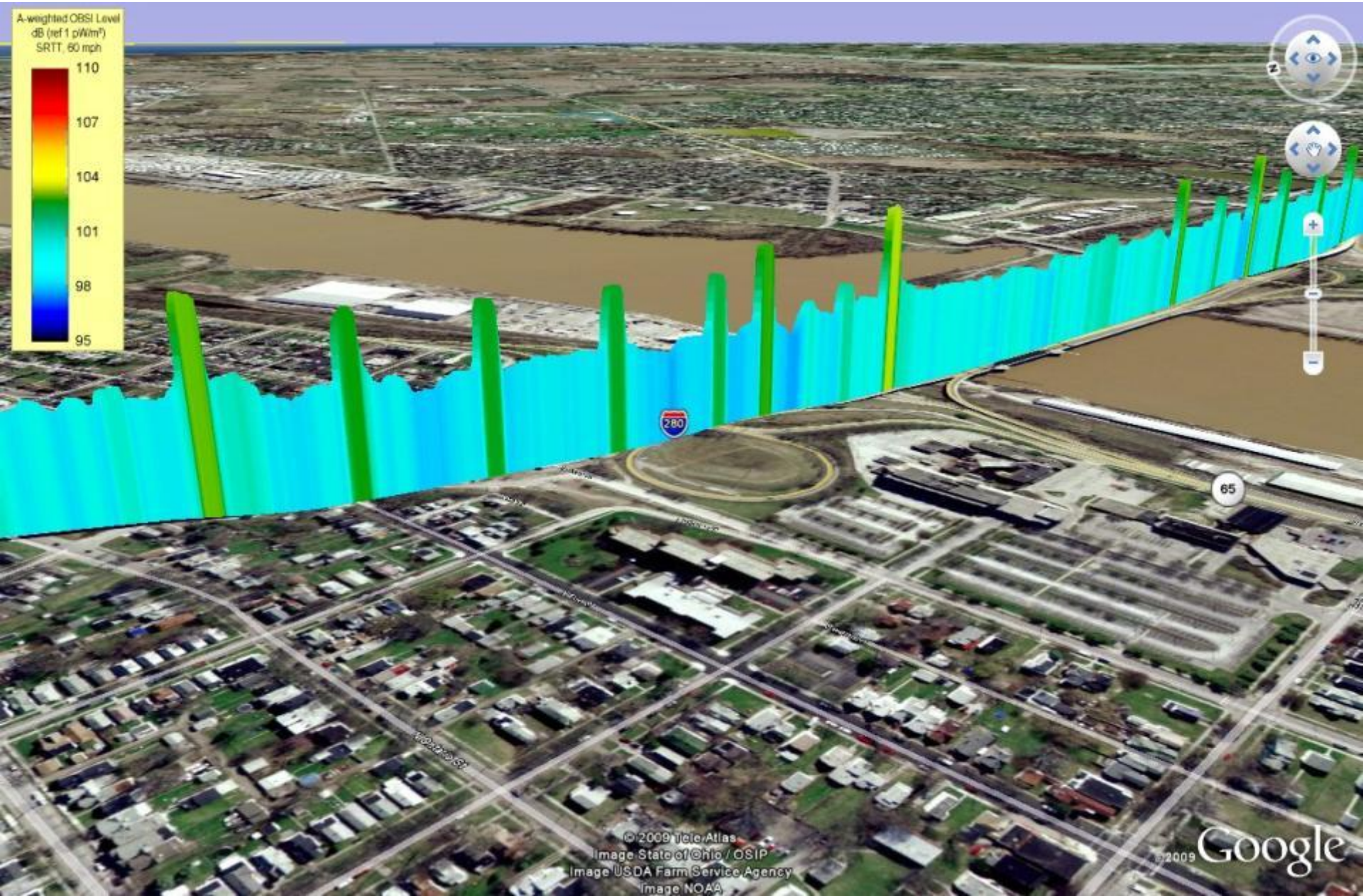
Visualization



Visualization



Visualization



Thank You!



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