Advanced Methods to Identify Asphalt Pavement Delamination--R06D

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AMERICAN ASSOCIATION
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TRANSPORTATION OFFICIALS
AASHTO

What is SHRP2?

- The Second Strategic Highway Research Program (SHRP2): a large scale research program designed to make significant advances in some of the most challenging areas in the highway industry

- 9-year, $232 million research program

- TRB: managed over 100 research projects, involving more than 300 research contractors

- Implementation budget of just over $170 million

Quick SHRP2 Overview

- **SHRP2 Solutions** – 63 products

- **Solution Development** – processes, software, testing procedures, and specifications

- **Field Testing** – refined in the field

- **Implementation** – 430 transportation projects; adopt as standard practice

- **SHRP2 Education Connection** – connecting next-generation professionals with next-generation innovations

430
SHRP2 projects nationwide

Focus Areas

Safety: fostering safer driving through analysis of driver, roadway, and vehicle factors in crashes, near crashes, and ordinary driving

Reliability: reducing congestion and creating more predictable travel times through better operations

Capacity: planning and designing a highway system that offers minimum disruption and meets the environmental and economic needs of the community
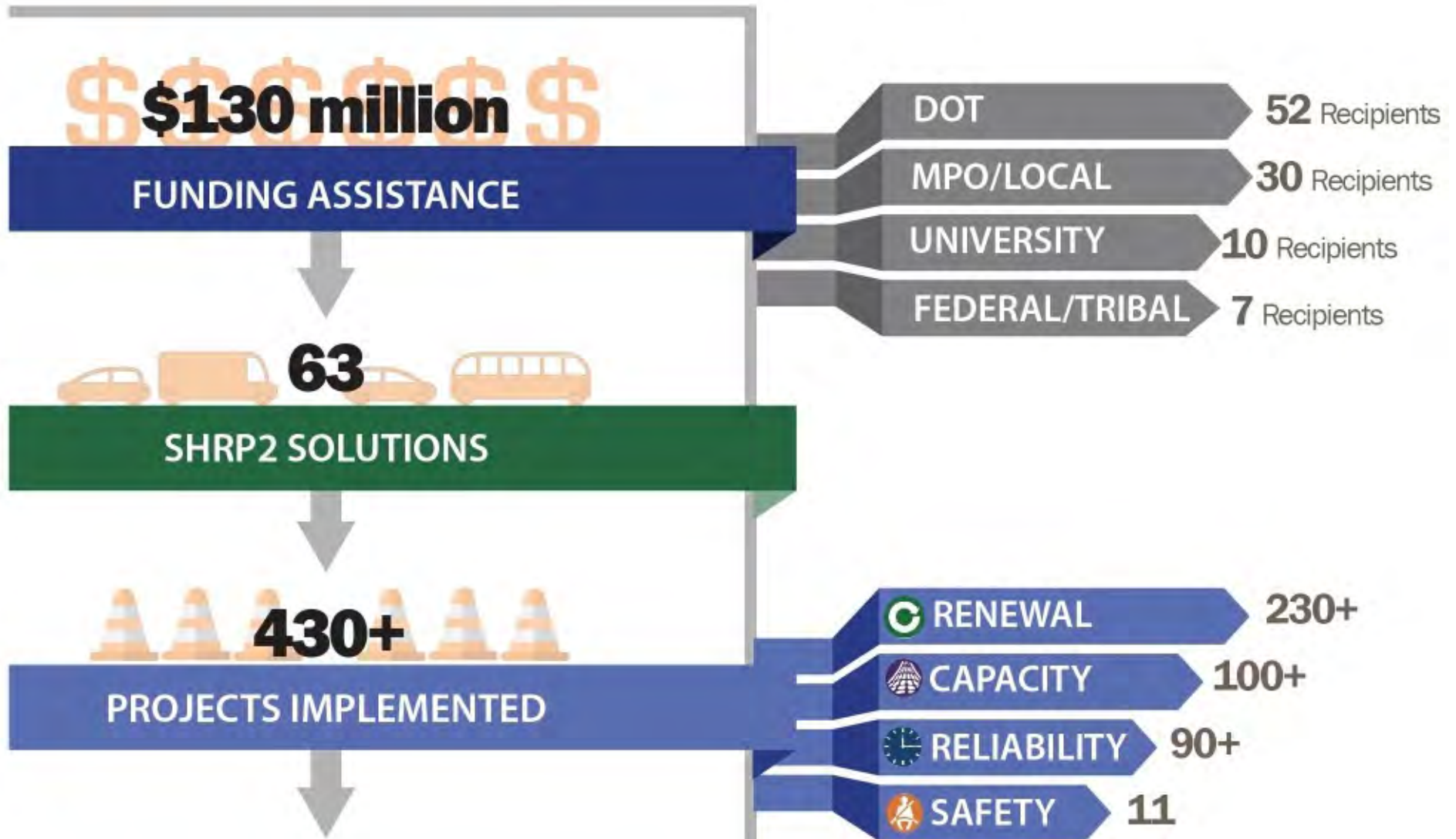
Renewal: rapid maintenance and repair of the deteriorating infrastructure using already-available resources, innovations, and technologies

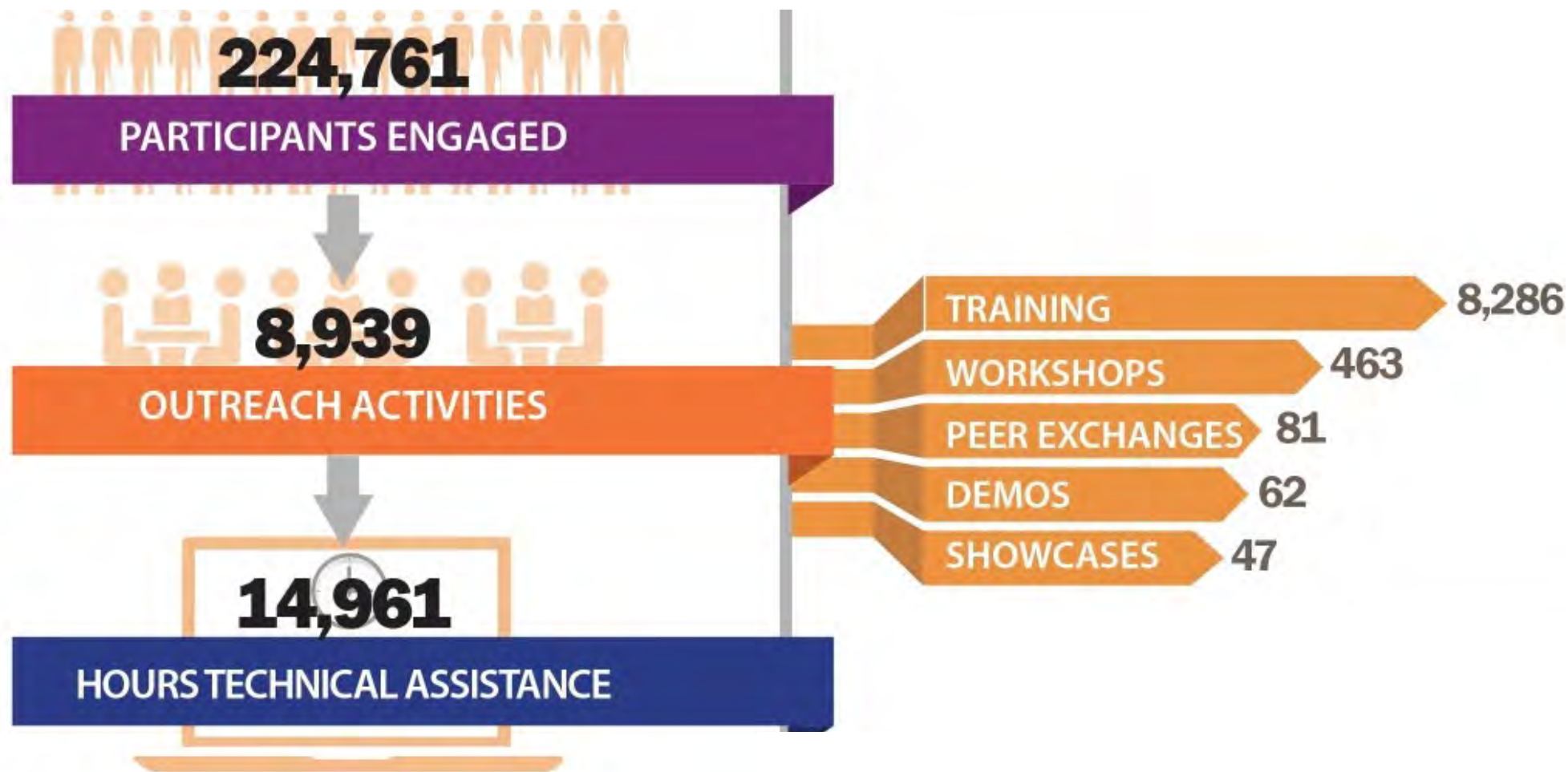# SHRP2 Implementation Assistance Program

- Designed to help State DOTs, MPOs, local agencies, and other interested organizations deploy SHRP2 Solutions.

Proof of Concept Pilot	Lead Adopter Incentive	User Incentive
To evaluate product readiness.	To help offset costs associated with product implementation and risk mitigation.	To support implementation activities, such as conducting internal assessments, changing processes, and organizing peer exchanges.

$130 million
FUNDING ASSISTANCE

DOT	52 Recipients
MPO/LOCAL	30 Recipients
UNIVERSITY	10 Recipients
FEDERAL/TRIBAL	7 Recipients

63
SHRP2 SOLUTIONS

430+
PROJECTS IMPLEMENTED

RENEWAL	230+
CAPACITY	100+
RELIABILITY	90+
SAFETY	11

SHRP2 Implementation: INNOVATE.IMPLEMENT.IMPROVE.

224,761 PARTICIPANTS ENGAGED

8,939 OUTREACH ACTIVITIES

- TRAINING 8,286
- WORKSHOPS 463
- PEER EXCHANGES 81
- DEMOS 62
- SHOWCASES 47

14,961 HOURS TECHNICAL ASSISTANCE

Advanced Methods to Identify Pavement Delamination (R06D)

Challenge

- Asphalt is typically laid in multiple layers of thickness. If those layers don't bond together, pavement problems begin to show at the surface

- Delamination between asphalt layers causes surface distresses like cracking and tearing

- Pavement performance drastically drops, creating safety and cost issues

Solution

- Technology that detect delamination under the surface of pavement before it becomes a larger issue.

- **Measure at reasonable traveling speed**

- **Cover full-lane width**

R06D Test Sections at NCAT Test Track

|	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6	Section 7	Section 8	Section 9	Section 10
Top 2-inch lift	Full bond	Full bond	Full bond	**Partial No bond**	**No bond**	**partial stripping**	Full bond	Full bond	Full bond	Full bond
Bottom 3-inch lift	**no bond**	Full bond	Full bond	Full bond	Full bond	Full bond	Full bond	**partial Stripping**	**partial No bond**	**No bond**
Existing surface	PCC	PCC	HMA	HMA	HMA	HMA	HMA	HMA	HMA	HMA

R06D Technology

Solutions

- Ground Penetrating Radar (GPR) **antenna array with frequency sweep**

- Impact echo (IE) and seismic analysis of surface waves (SASW) **rolling wheel scanning system**

Data Acquisition Computer

Distance wheel

Transducer Wheel Pairs
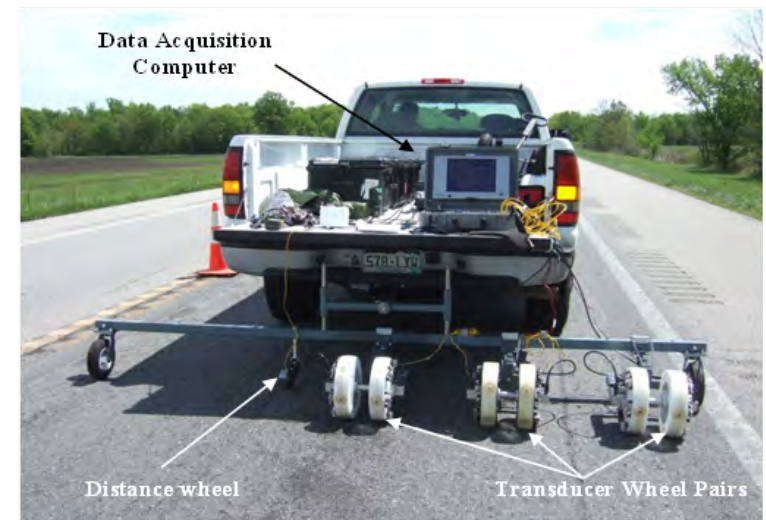
GPR Technology

Advantages

- Can be used at highway speeds

- Covers large areas

- Can fine other subsurface features (utilities)
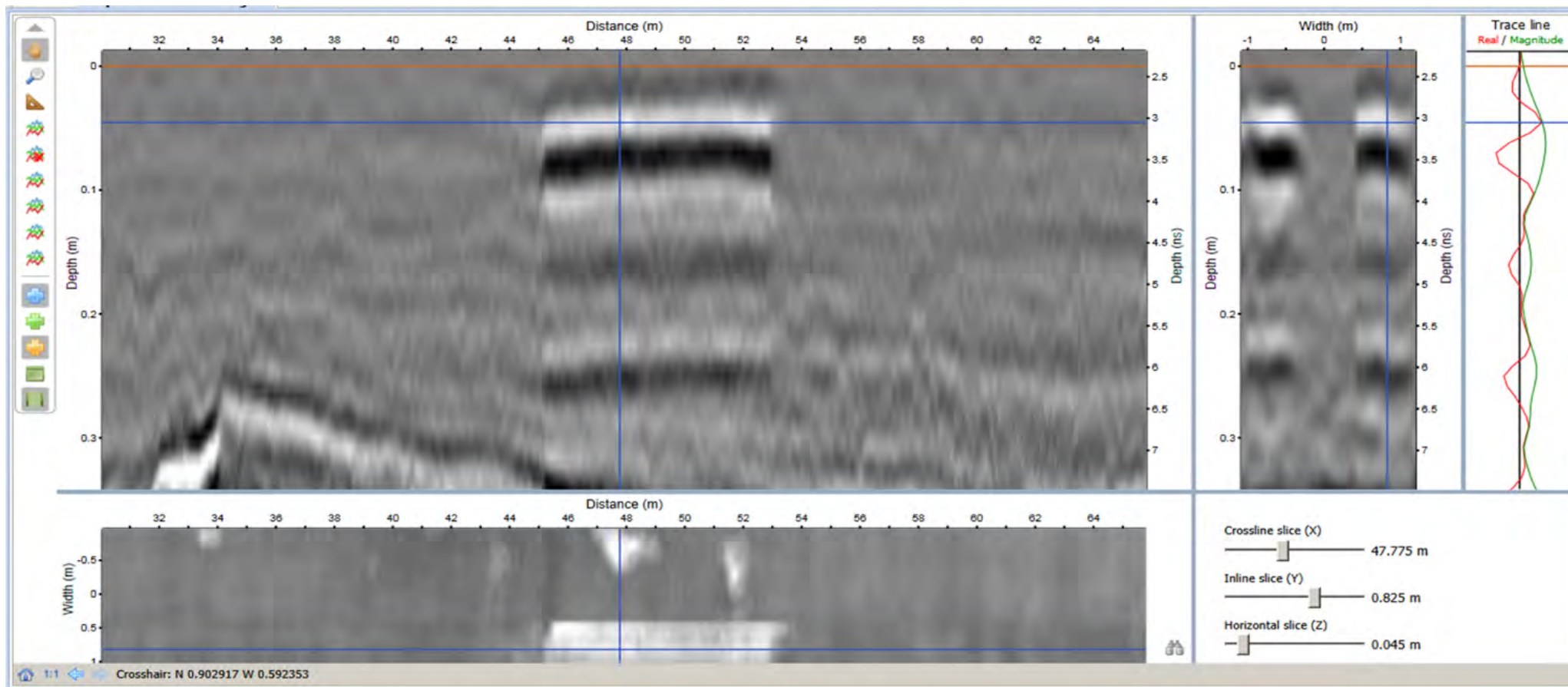
- Can be used in live traffic

Limitations

- Cannot distinguish delamination where the bond of the asphalt lifts is weak or missing

- Must have moderate change in material with air or water present

GPR at NCAT Test Track

Project Length Analysis – Single Pass

Activity Index

Likelihood of damage ----->

+ = core location

GPR on Florida DOT Research Lane

Lane 5 - depth slice at 1.5"

Temperature profile map

SOLUTIONS | 15
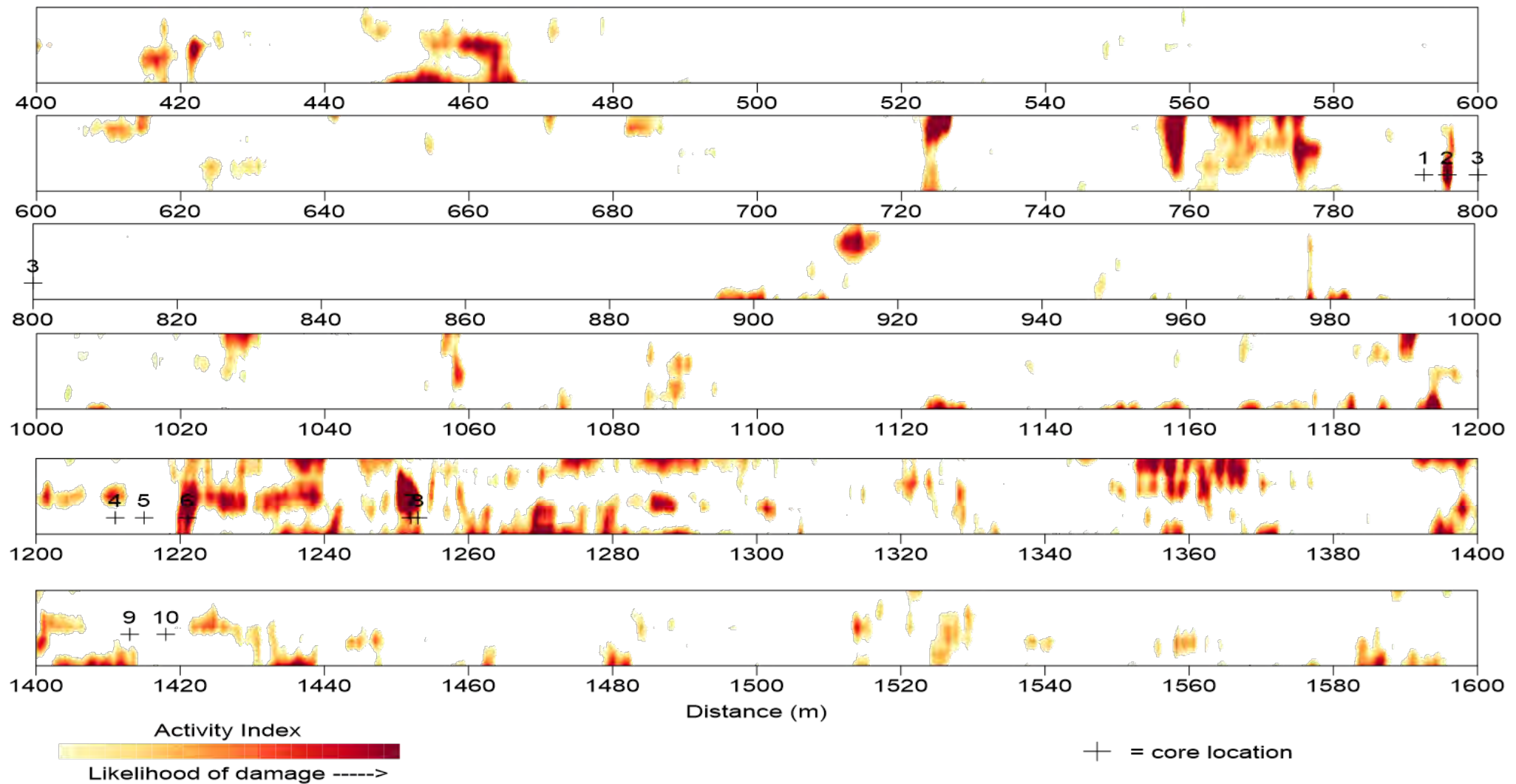
IE & SASW Technology

Advantages

- Can distinguish debonding (delamination)

- Covers large areas compared to point testing

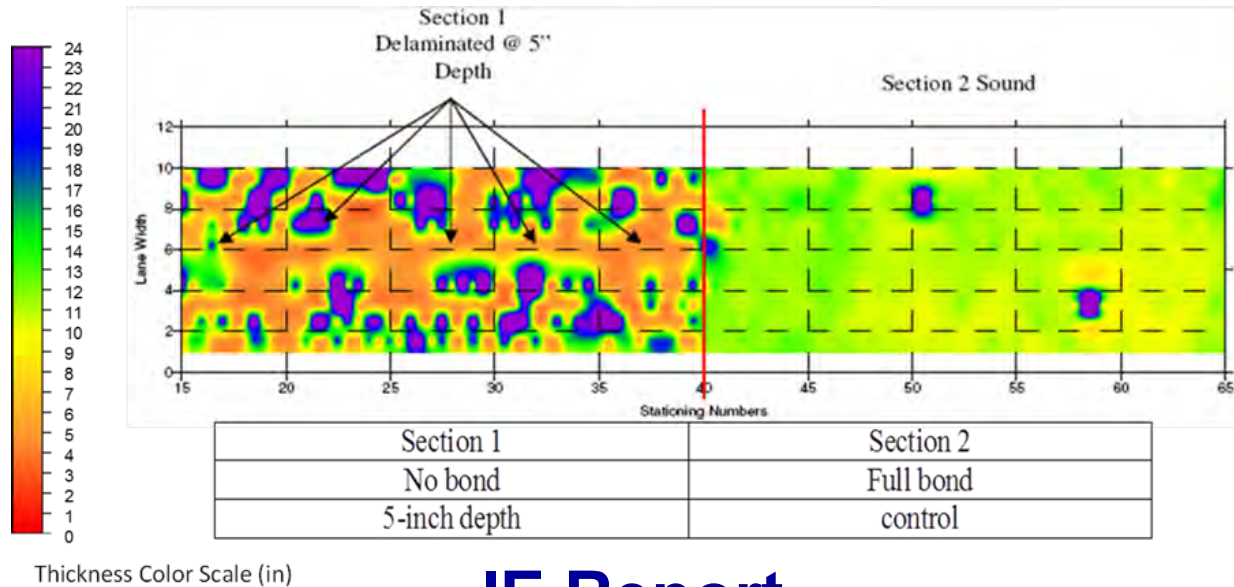- Can find concrete delamination and cracking

Limitations

- Requires a lane closure

- Cannot be used at highway speed

- Technology works best on stiff materials
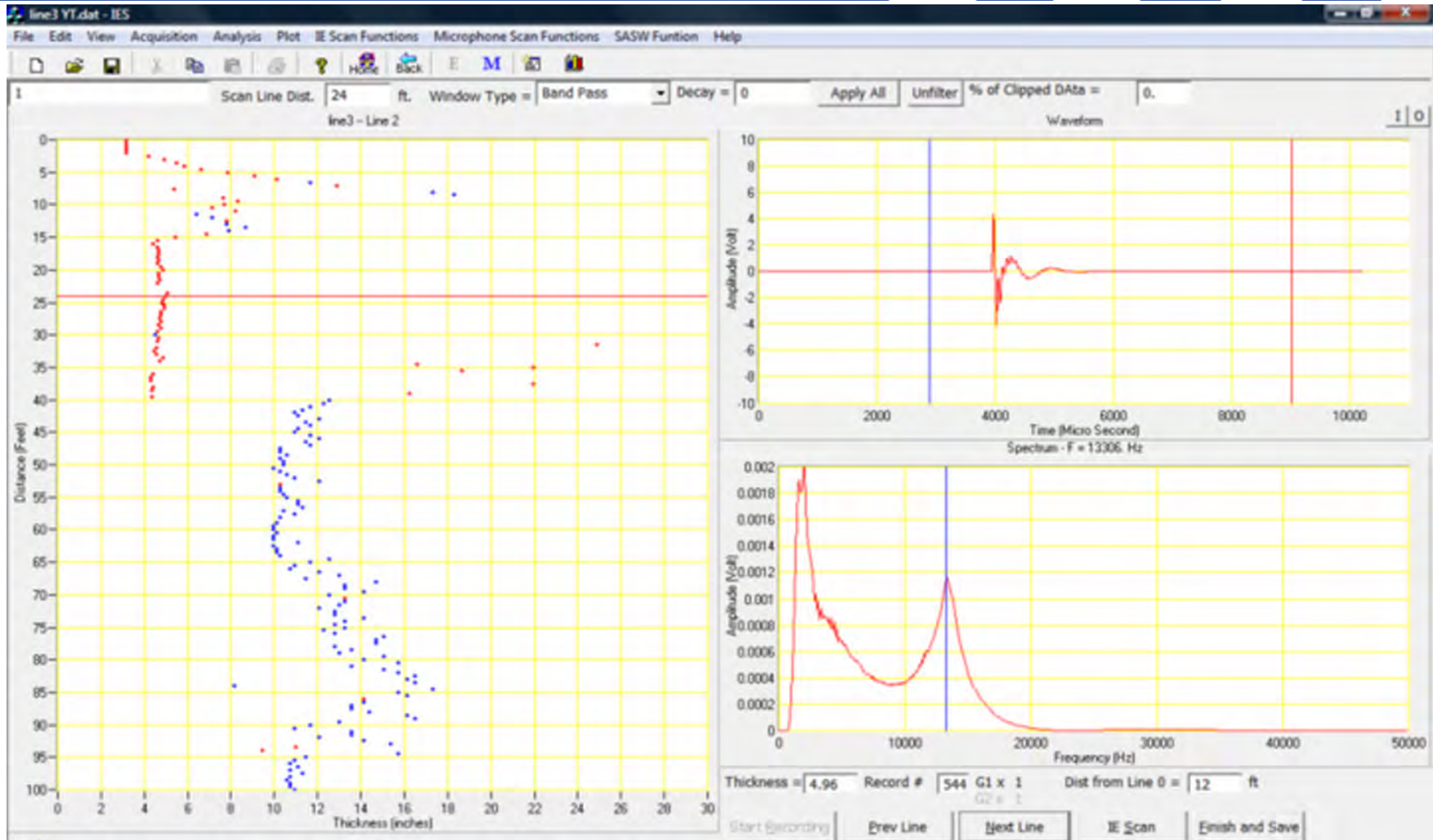
IE & SASW
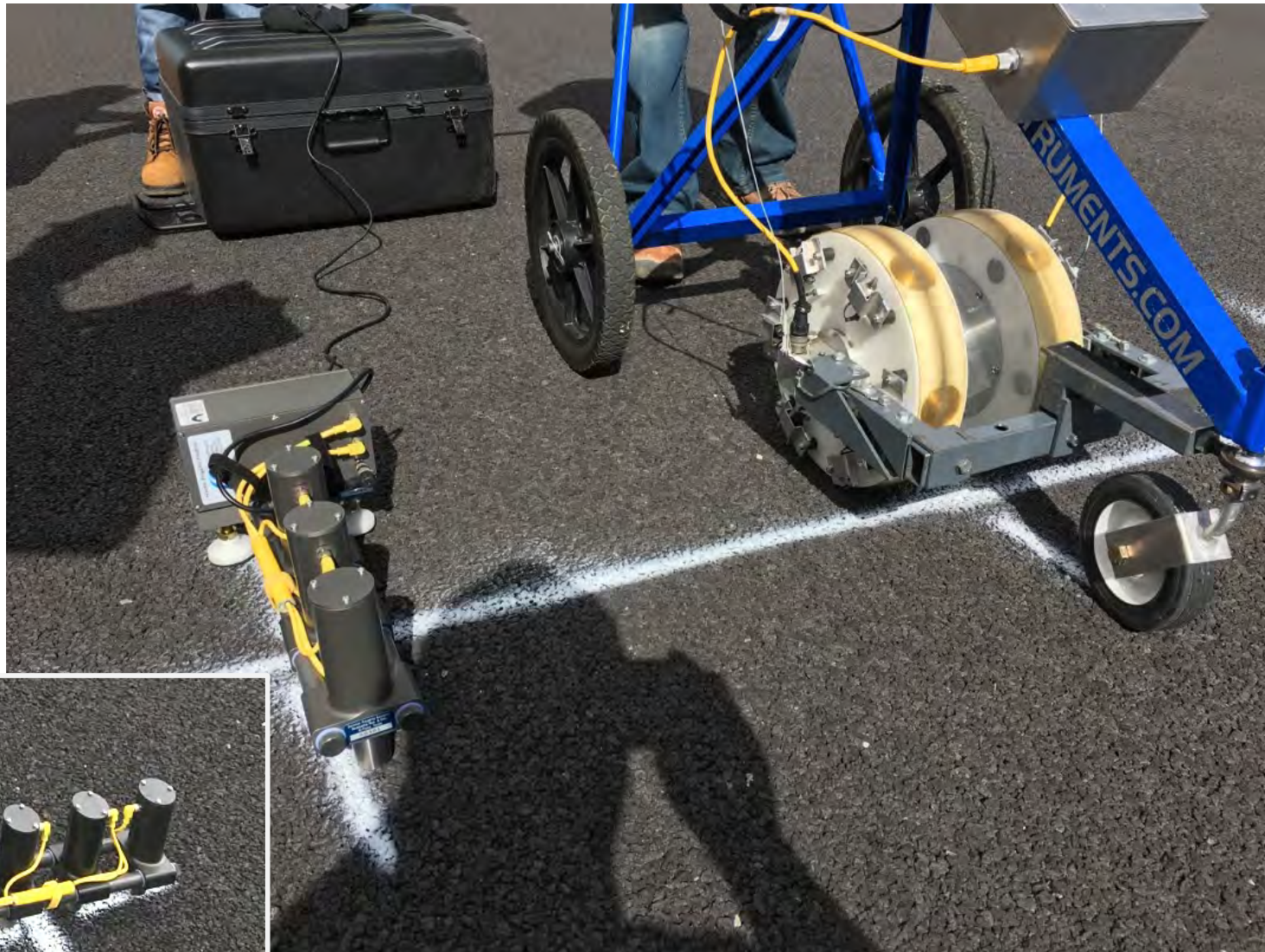
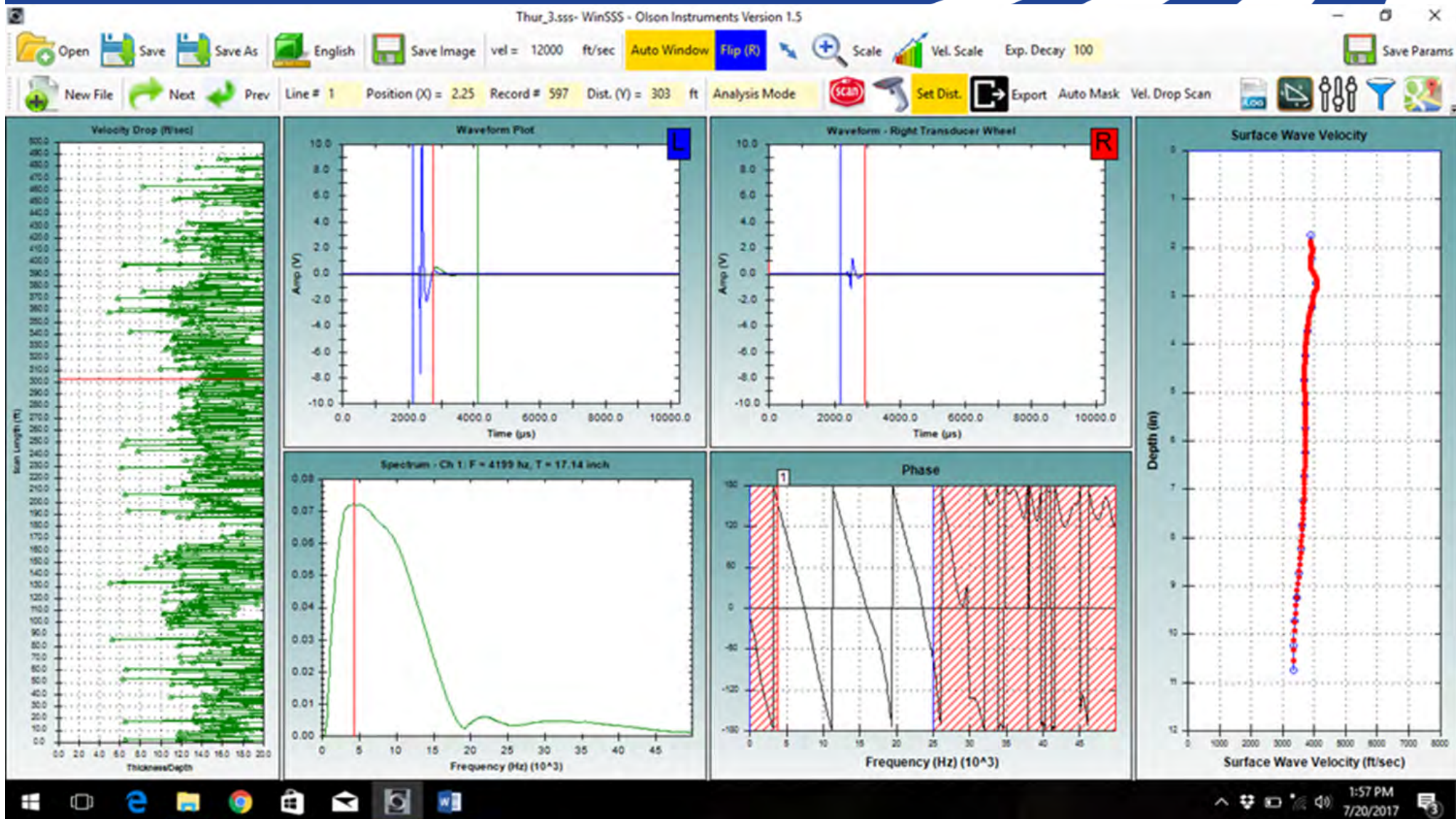# IE / SASW at NCAT Test Track

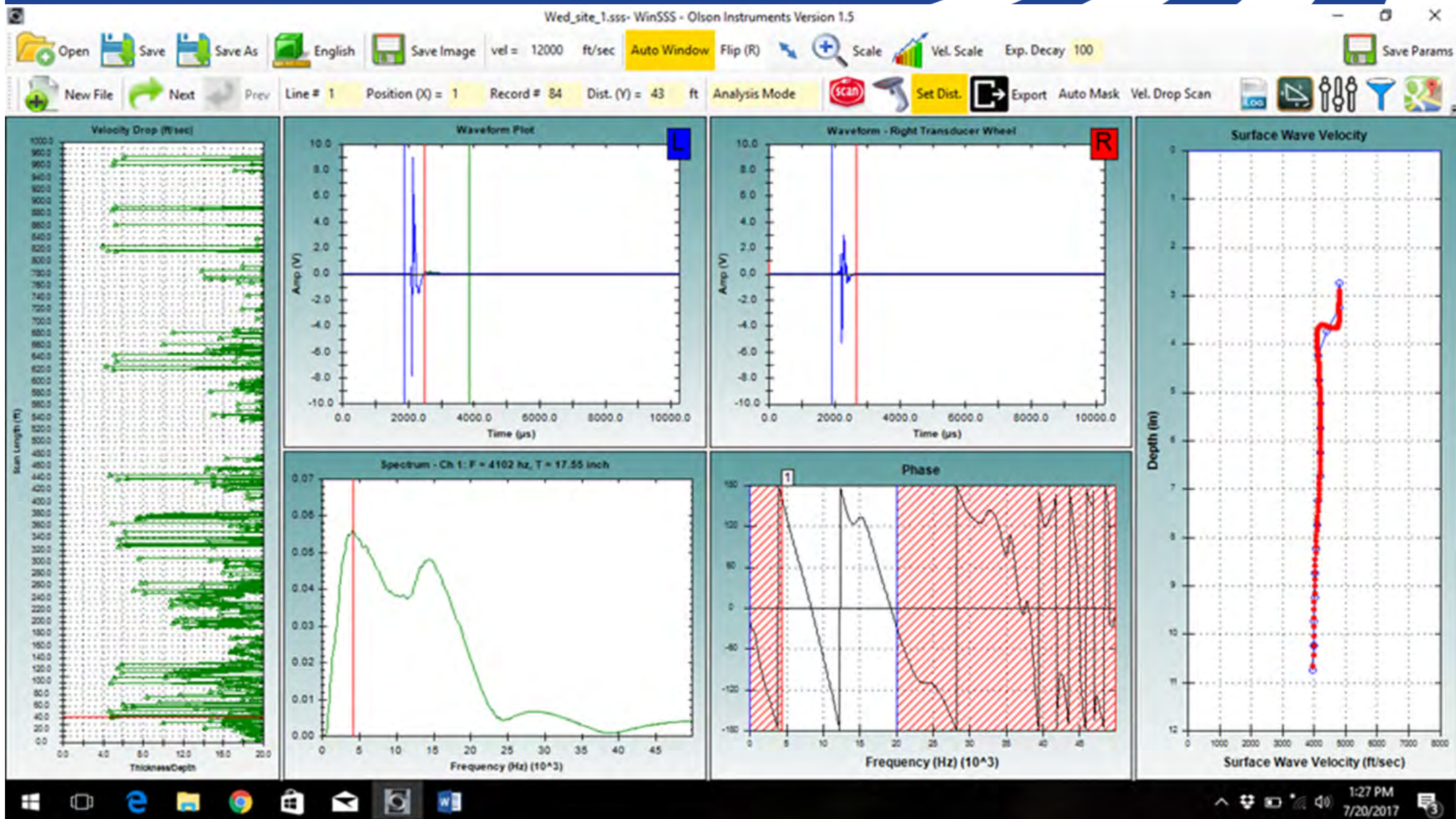**IE Report**

SASW Report
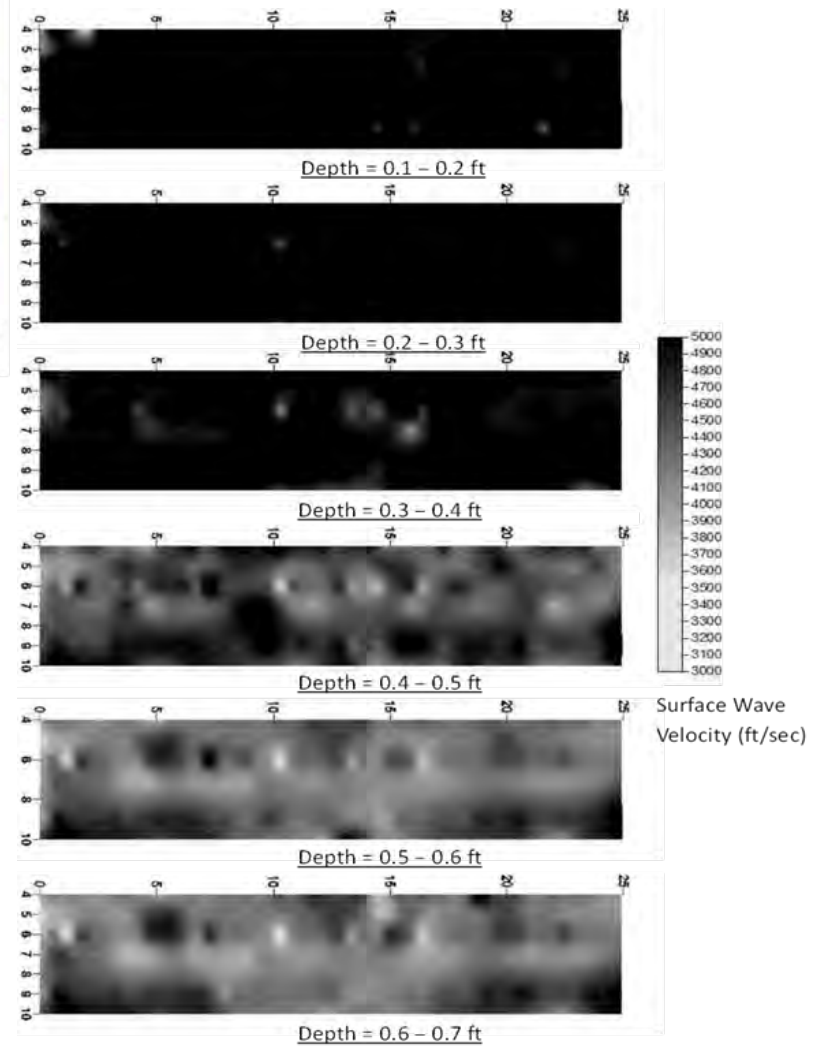
Real-time IE Output During Test

Real-time IE Output During Test

Real-time IE Output During Test

R06D Technology Comparison

Benefits

- **GPR with frequency sweep antenna array**

  - Can identify variations in the pavement, and provide a relative degree of severity.

  - Operates at reasonable speed and up to full-lane width in a single pass.

- **IE/SASW scanner**

  - Can identify variations in the pavement; isolate the depth of discontinuity.

  - Can identify debonding between asphalt layers

- **Both Technologies**

  - Excellent forensic tool for project level analysis

  - Multi-functional NDT (pavement, bridge decks, etc…)

Implementation Assistance Program States

Round 7	
California	Minnesota
Florida	New Mexico
Kentucky	Texas

Save Lives

Single-pass and full-lane coverage improve safety by minimizing the time technicians are exposed to traffic.

Save Money

Single-pass operation minimizes data collection costs. Full-lane coverage increases testing efficiency and reduces data-collection costs.
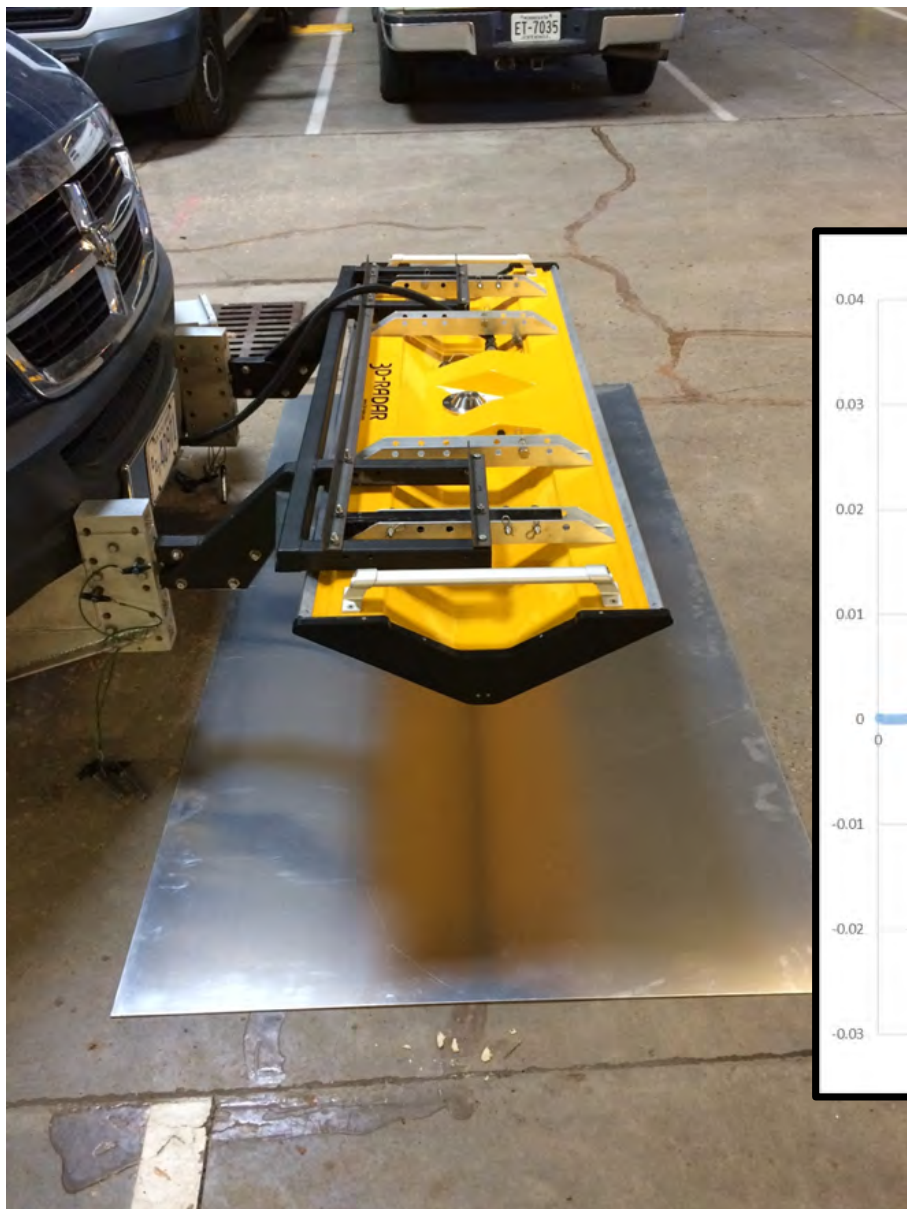
Save Time

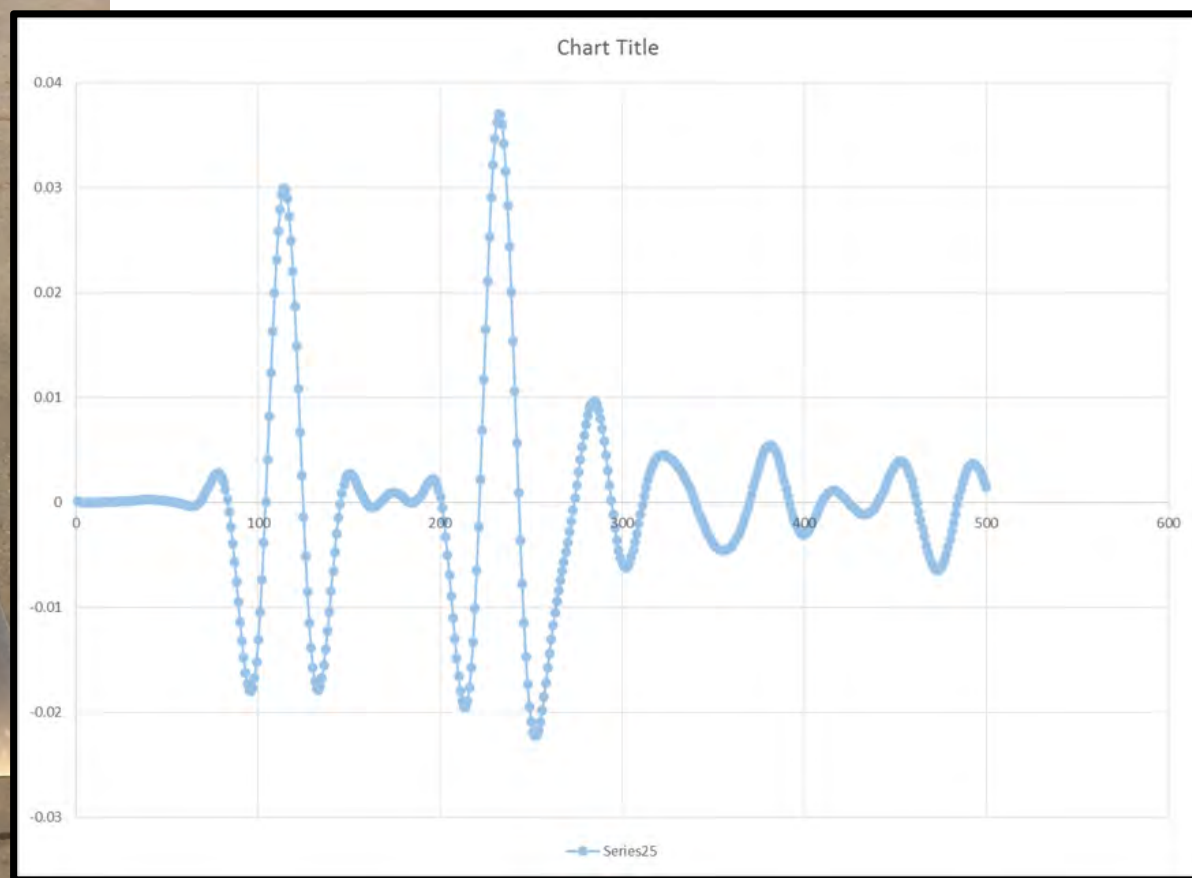Full-lane coverage and single-pass operations reduce the time to collect field data.

Mounting the GPR Antenna
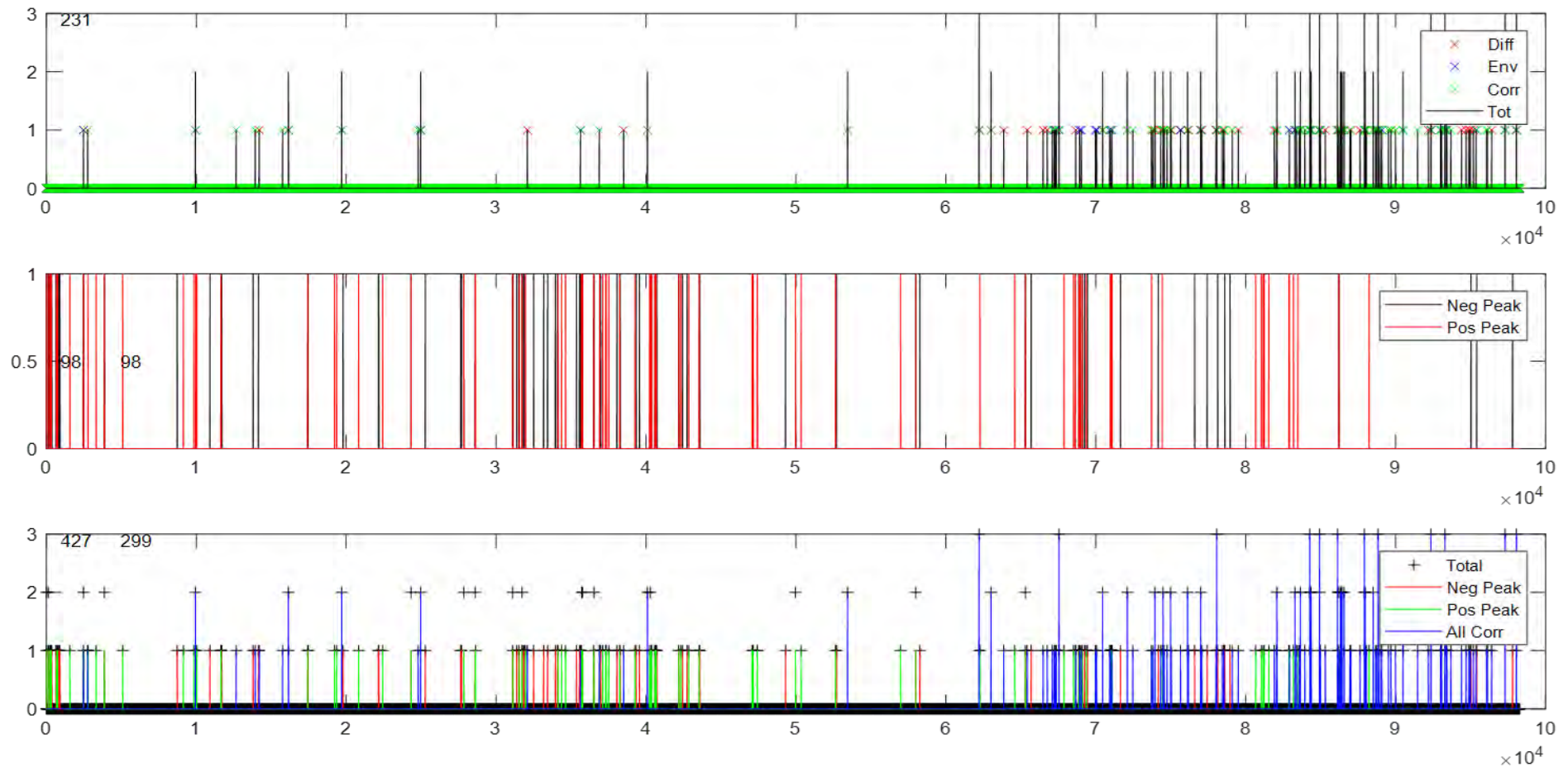
IAP State Activities

Calibrating the Antenna

IAP State Activities

Automated Data Analysis

What's Next for R06D

The Future

Product demand will drive software development to make data analysis more efficient and effective.

- Real-time display detail
- Automated signal identification in distressed areas

For More Information on R06D

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Additional Resources:

GoSHRP2 Website:	fhwa.dot.gov/GoSHRP2
AASHTO SHRP2 Website:	http://shrp2.transportation.org
R06D Product Page	**Coming soon**