

# NEW YORK

# 2022



## THE RACE TO BETTER DATA

## APRIL 25TH-28TH, SARATOGA SPRINGS

### The Pavement Texture Signature

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# EFFECTS OF RAINFALL ON SKID RESISTANCE



A FILM OF WATER  
5MM THICK  
**DECREASES**  
SKID RESISTANCE  
BY **20-30%**

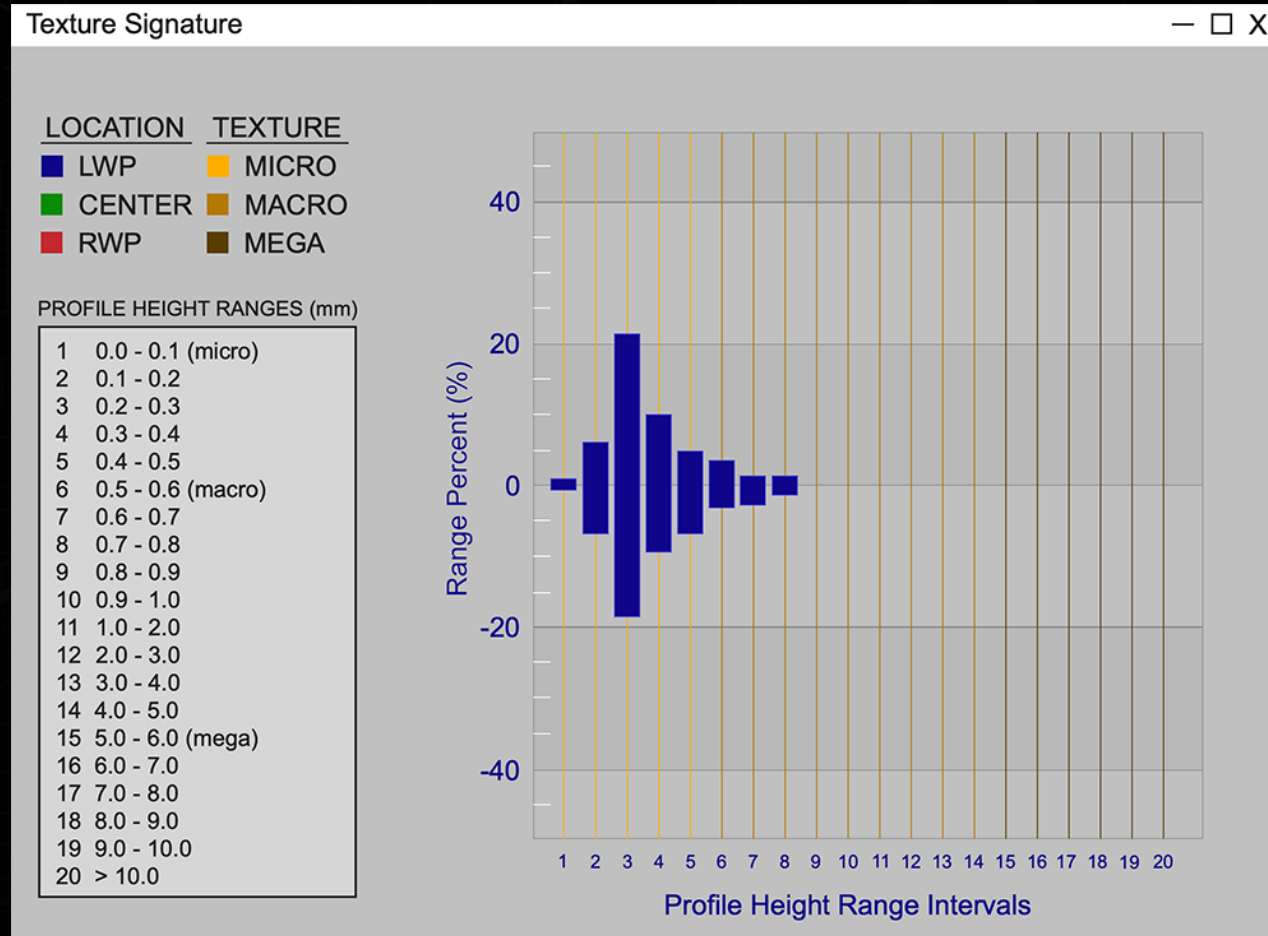
# RAINFALL RELATED VEHICLE CRASH STATISTICS



212,000 CRASH INJURIES  
*2,400 CRASH DEATHS*  
ANNUALLY IN THE U.S.

# THE TEXTURE SIGNATURE SYSTEM

## A NEW WAY TO LOOK AT PAVEMENT TEXTURE





# ASTM E1845 – CALCULATING MACROTEXTURE MEAN PROFILE DEPTH

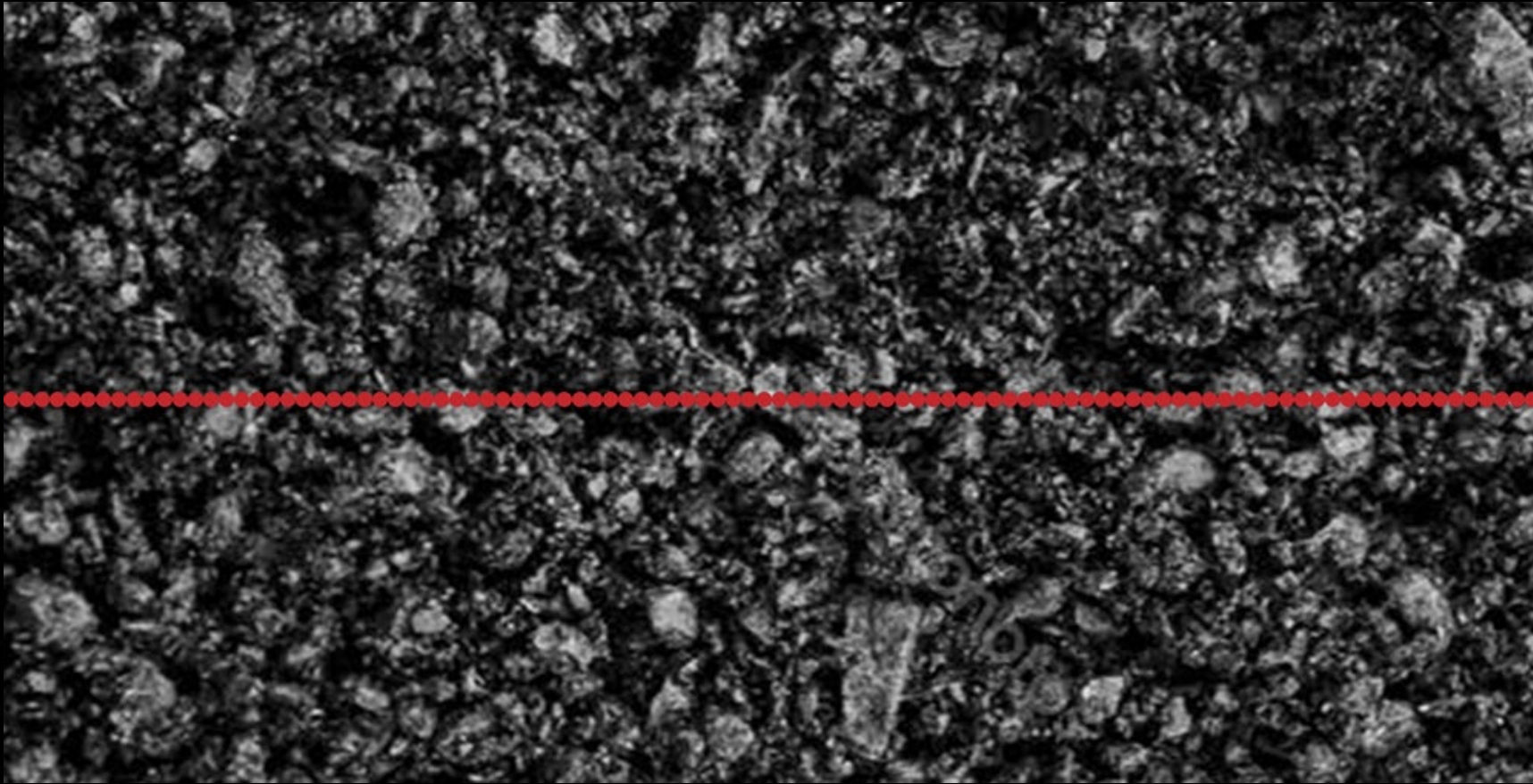
10M

○ 100mm texture profile



# ASTM E1845 – CALCULATING MACROTEXTURE MEAN PROFILE DEPTH

**100 DATA POINTS at 1MM RESOLUTION**

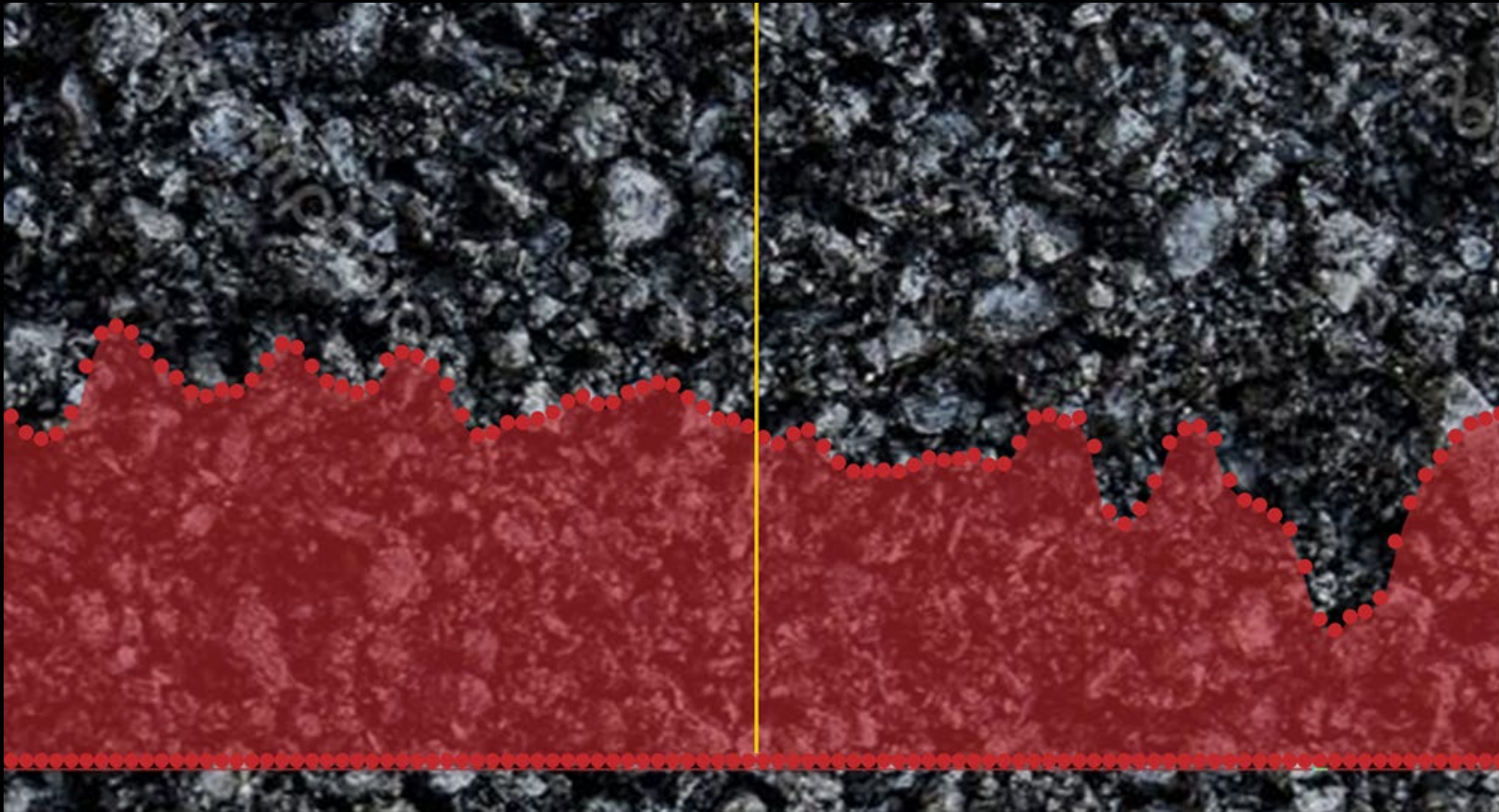


100mm



# ASTM E1845 – CALCULATING MACROTEXTURE MEAN PROFILE DEPTH

**100MM TEXTURE PROFILE DIVIDED INTO 50MM SEGMENTS**

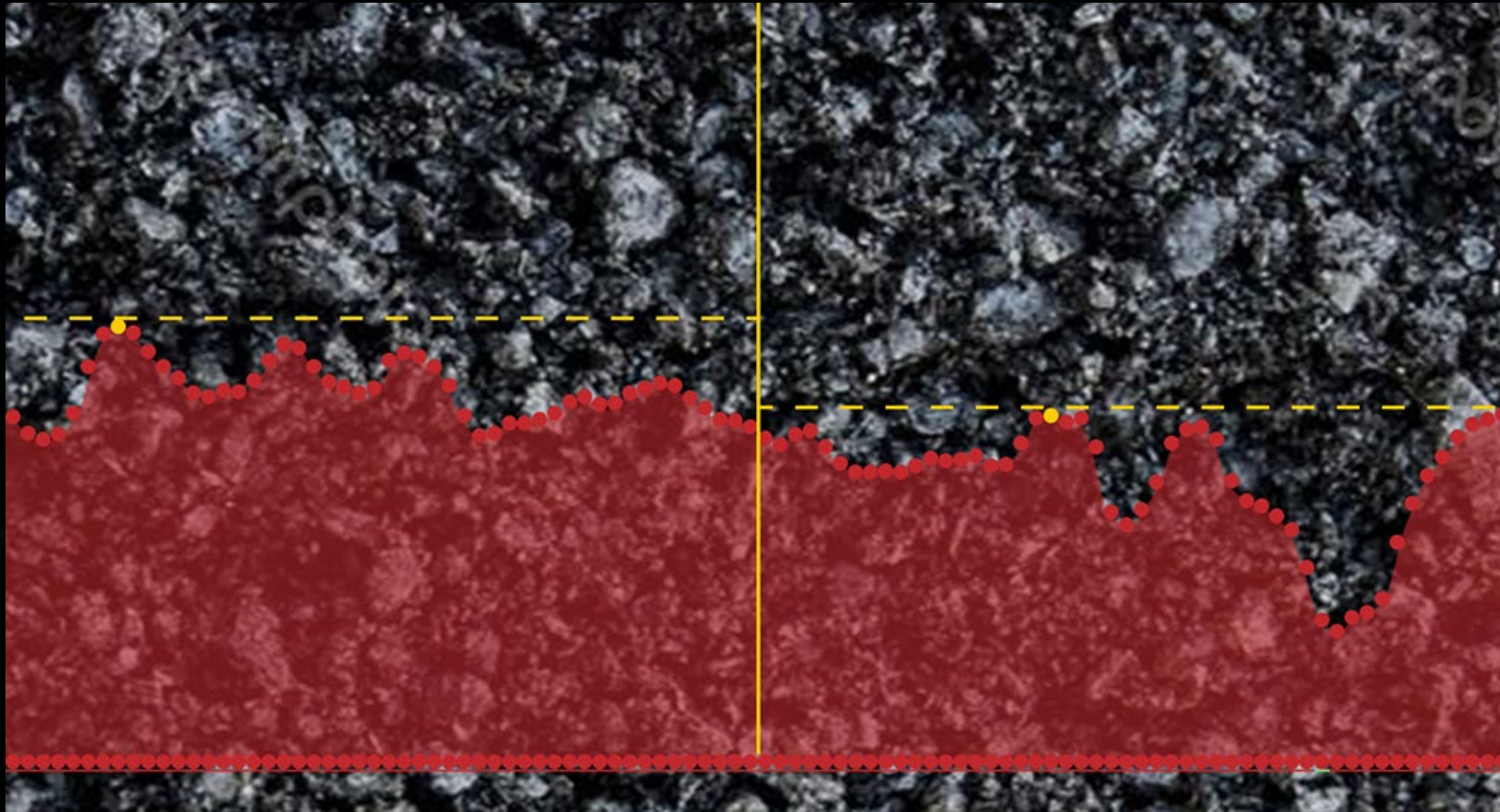


100mm



# ASTM E1845 – CALCULATING MACROTEXTURE MEAN PROFILE DEPTH

**IDENTIFY THE MAX PEAK HEIGHT FOR EACH 50MM SEGMENT**

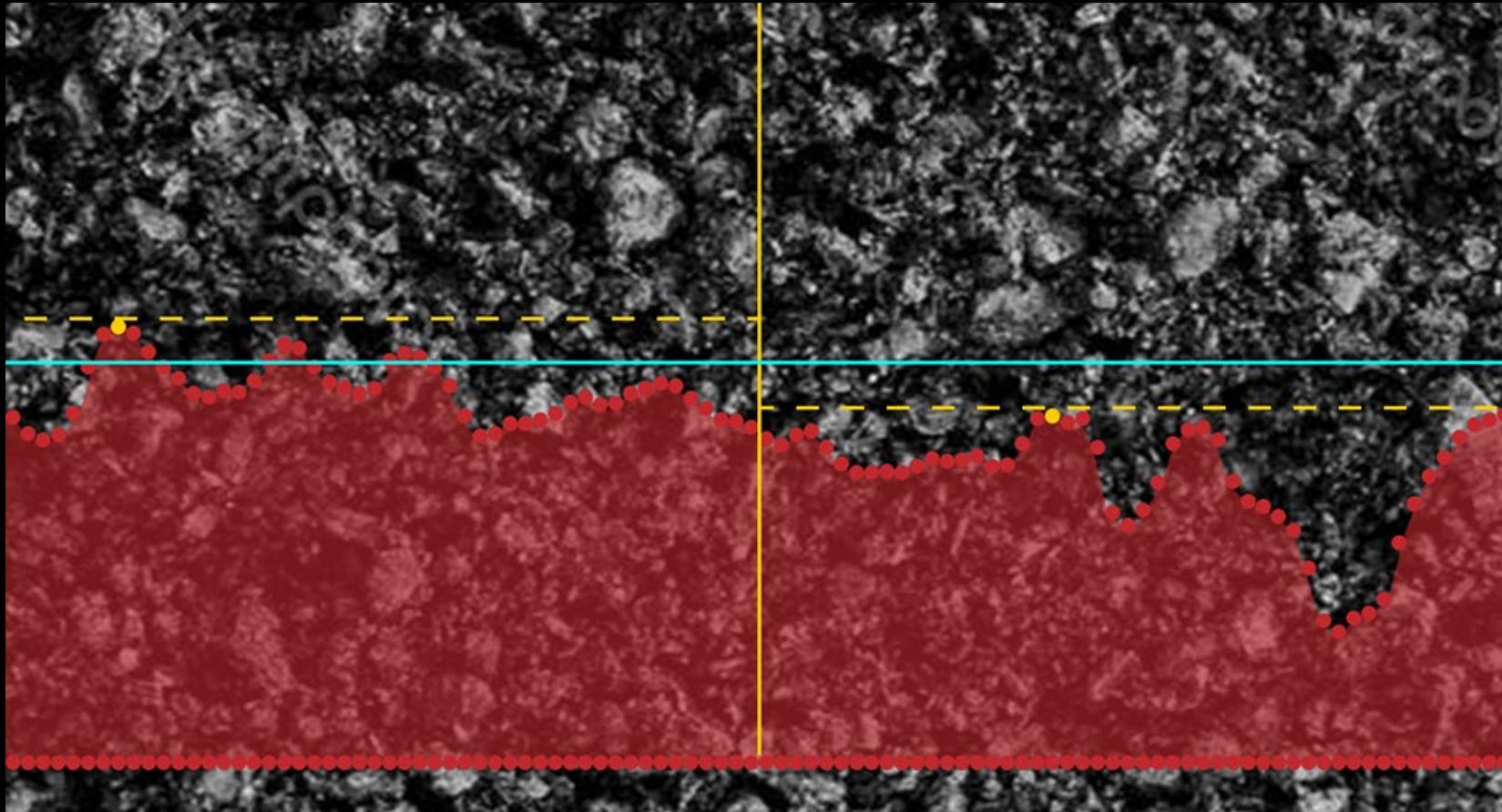


100mm



# ASTM E1845 – CALCULATING MACROTEXTURE MEAN PROFILE DEPTH

**AVERAGE THE 2 PEAKS FOR MEAN SEGMENT DEPTH**



100mm

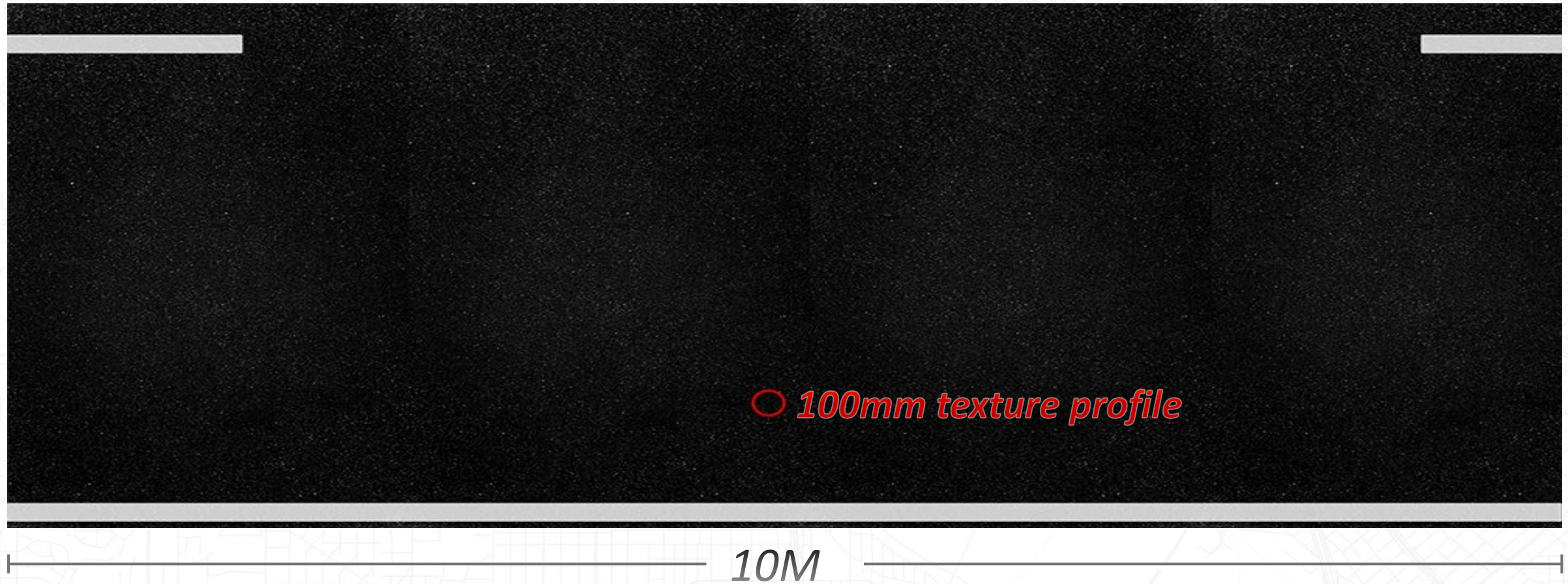
***MEAN PROFILE DEPTH***

*THE AVERAGE OF ALL MEAN SEGMENT DEPTHS  
COLLECTED IN A 100M SECTION*



## LIMITATIONS OF MEAN PROFILE DEPTH

**ONE 100MM LINE REPRESENTS 400 SQUARE FEET OF TEXTURE**

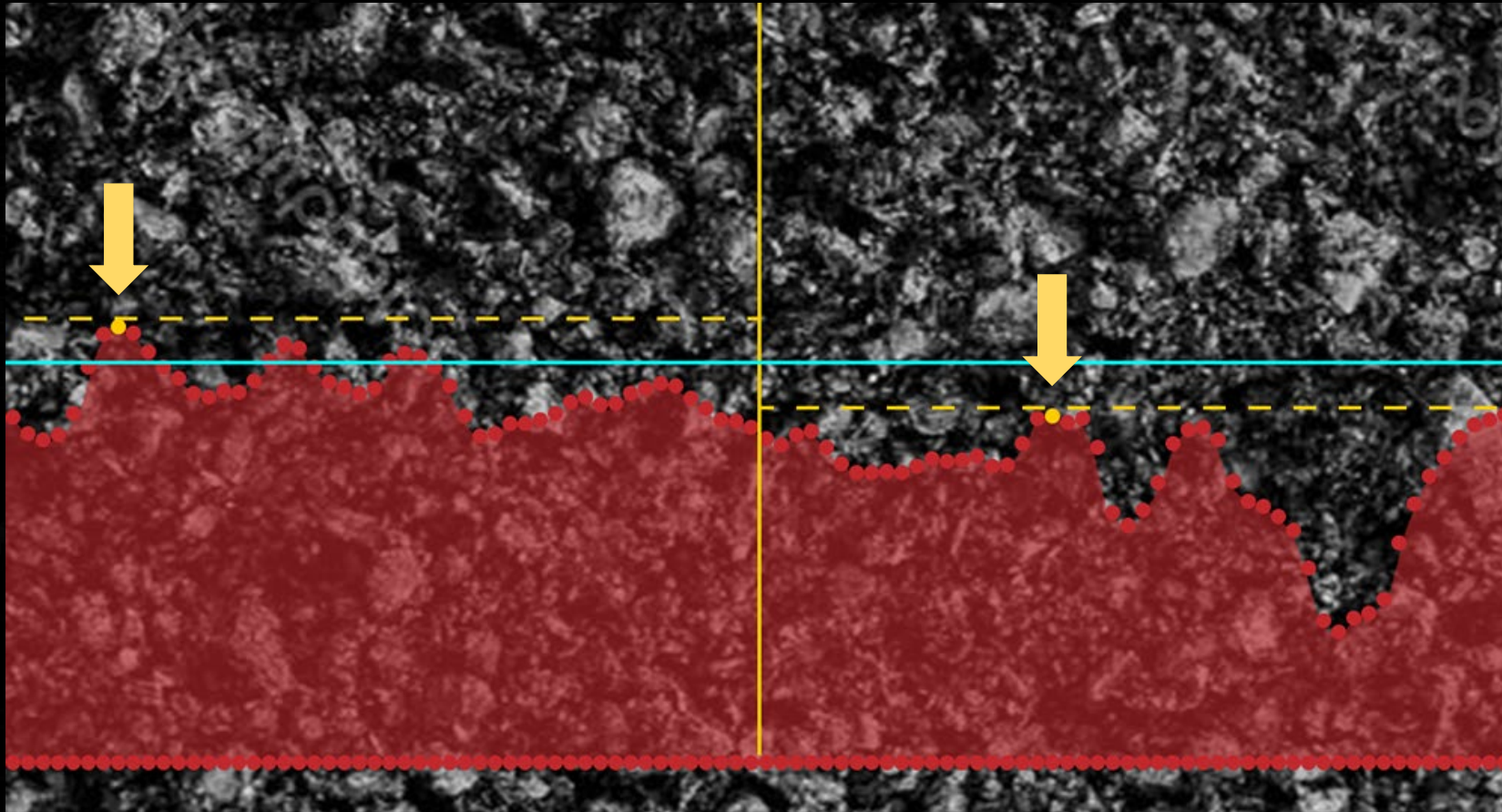




# *LIMITATIONS OF MEAN PROFILE DEPTH*

***MPD ONLY USES 2 PEAK DATA POINTS AND DILUTES THEM***

MPD AVERAGE



100mm



## LIMITATIONS OF MEAN PROFILE DEPTH

*“Aggregate particle shape, size, and distribution are surface texture features **NOT ADDRESSED** in this procedure. The method is **NOT MEANT TO PROVIDE A COMPLETE PICTURE OF SURFACE TEXTURE** characteristics. It is known that **THERE ARE PROBLEMS** in interpreting the result if the method is applied to **POROUS** surfaces or to **GROOVED SURFACES**. “*

## *LIMITATIONS OF SKID TESTING*

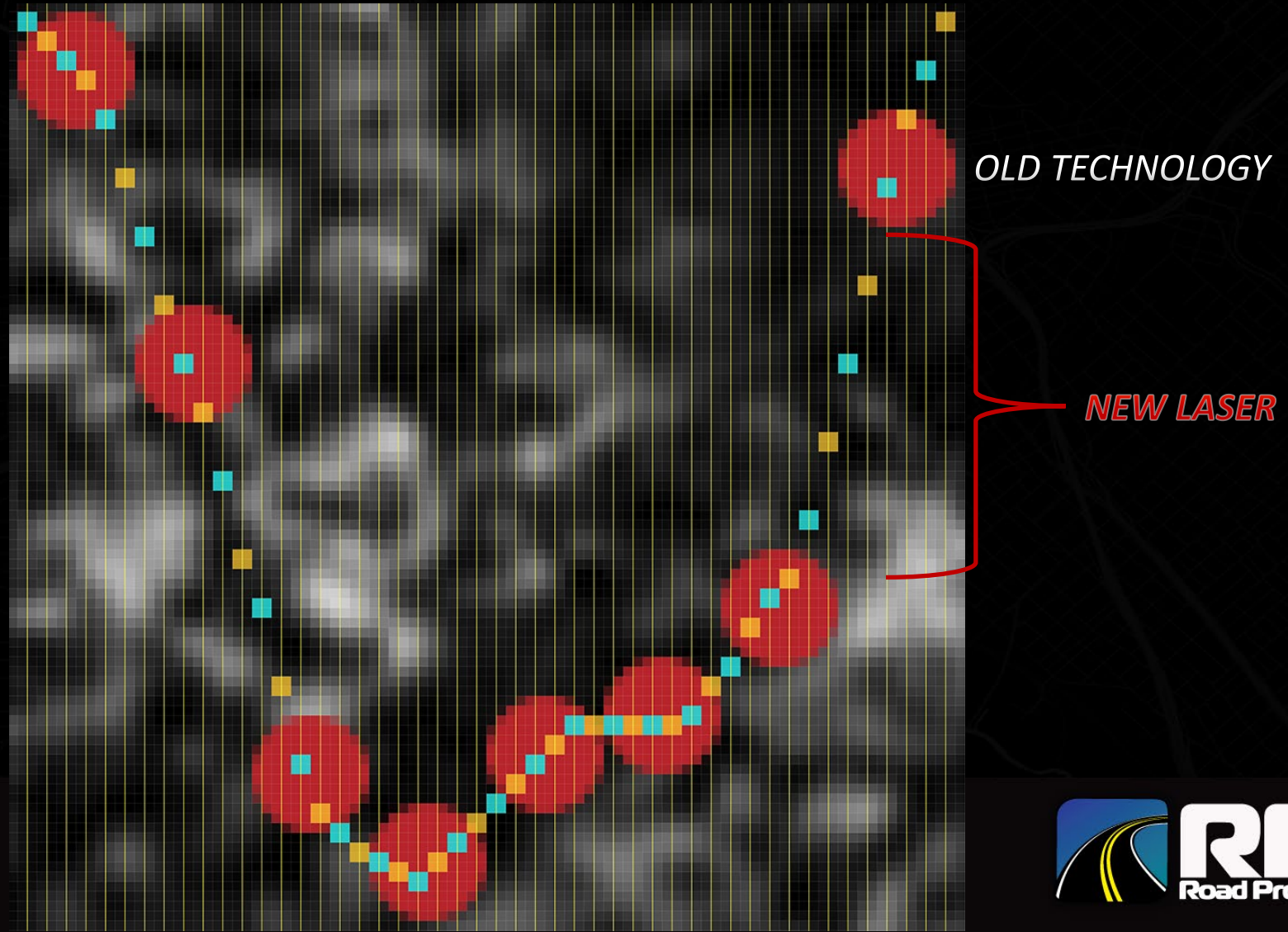
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- *STILL COLLECTING DATA ON SAMPLE AREAS*
- *TESTING IS EXPENSIVE AND TIME CONSUMING*
- *IT'S MORE DANGEROUS THAN DATA COLLECTION*
- *IMPEDING TRAFFIC COLLECTING AT 40MPH*
- *GENERALLY IMPRACTICAL FOR NETWORK LEVEL COLLECTION*



# NEW TECHNOLOGY CAPABILITIES

**5 TIMES THE RESOLUTION**





# NEW LASER TECHNOLOGY CAPABILITIES

10M

*COLLECTING TEXTURE DATA EVERY 1/3 OF AN INCH CONTINUOUSLY*

*NEW LASER DATA CAPTURE*



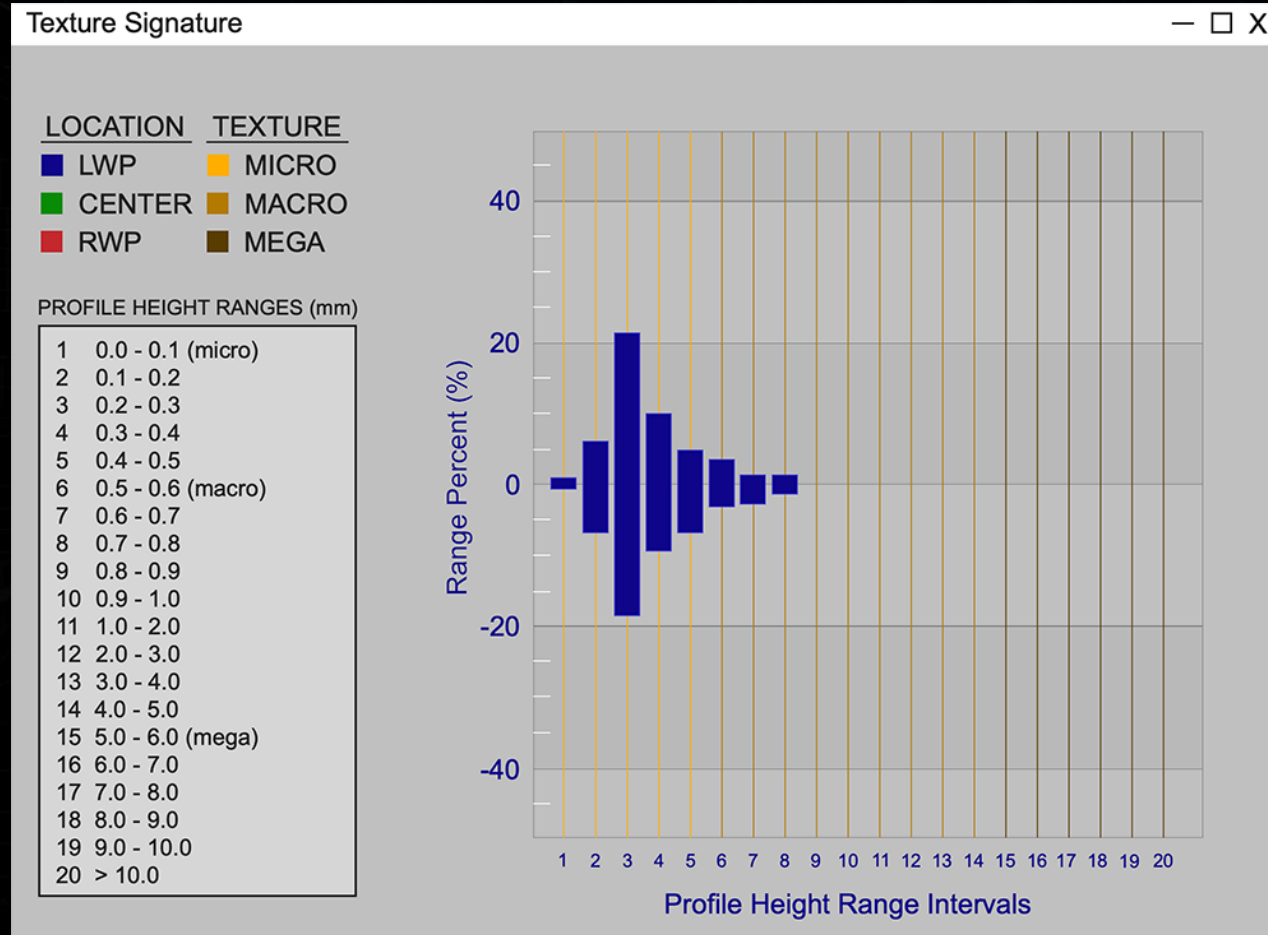
## NEW TECHNOLOGY COMPARISON

*100 vs. ½ MILLION DATA POINTS IN 10M  
1MM vs. 0.2MM RESOLUTION*

***5000 x THE AMOUNT OF DATA  
AT 5 x THE RESOLUTION***

# A NEW WAY OF EVALUATING TEXTURE DATA

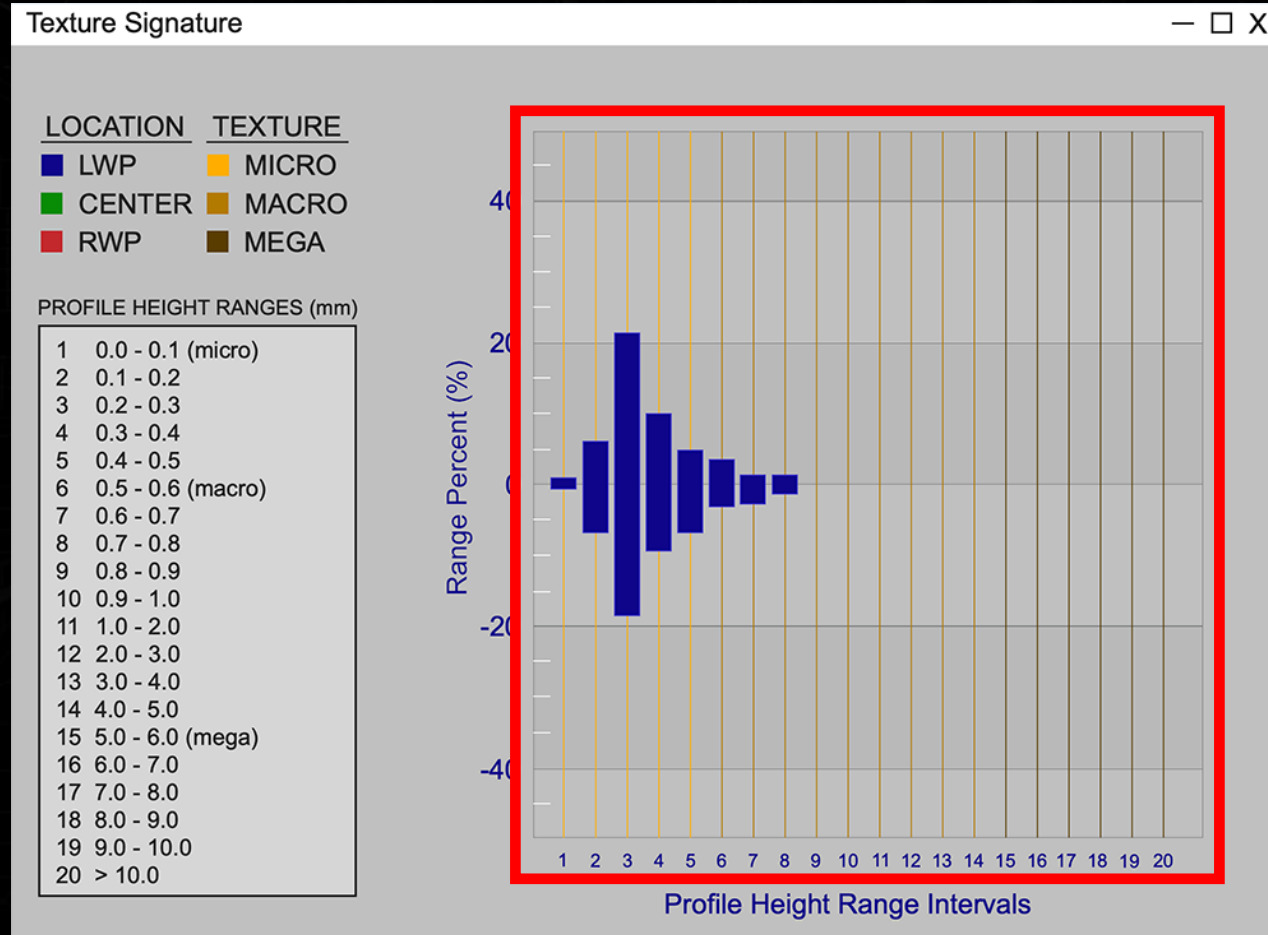
## THE TEXTURE SIGNATURE





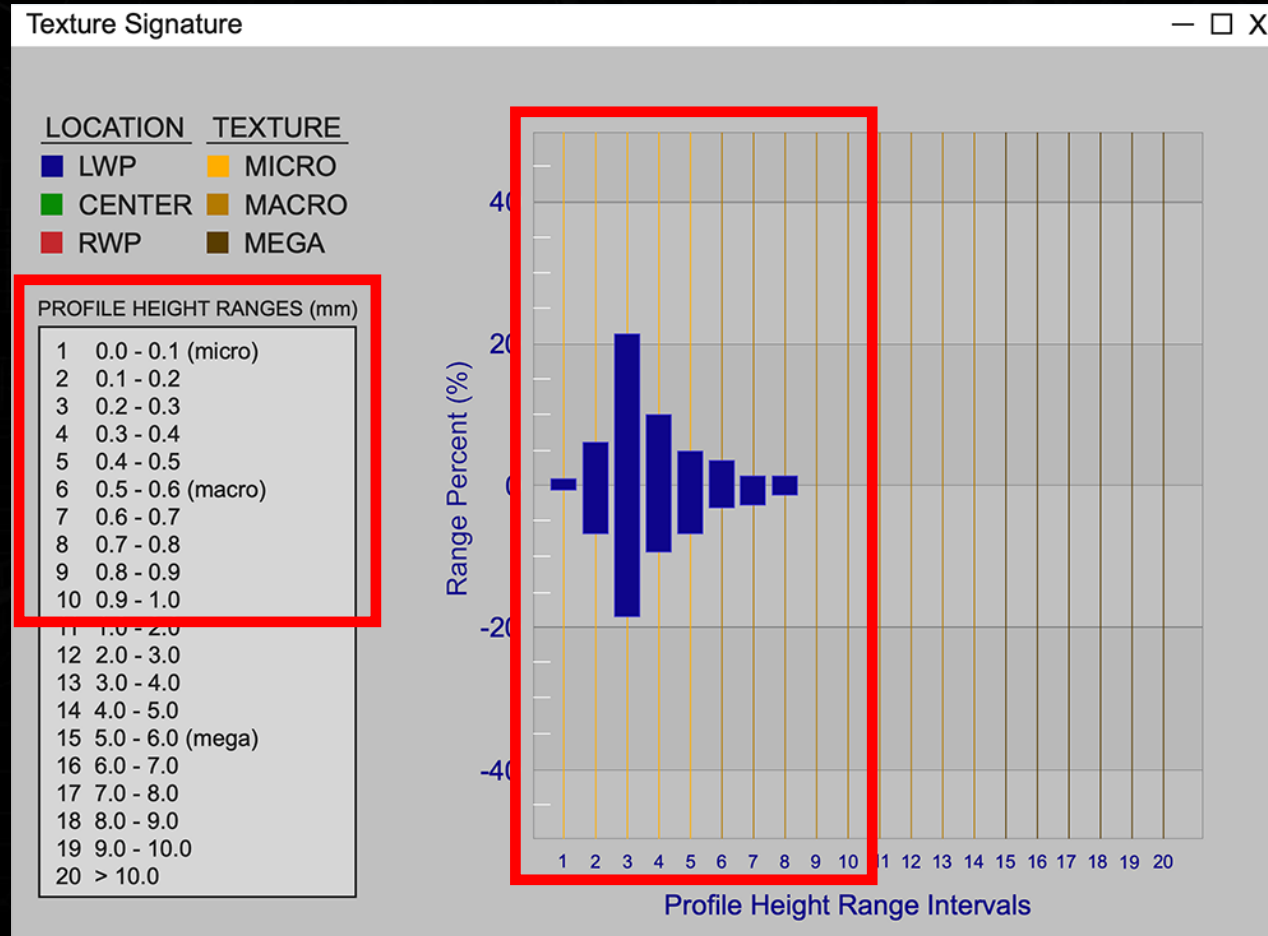
# A NEW WAY OF EVALUATING TEXTURE DATA

## THE TEXTURE SIGNATURE: BINS



# A NEW WAY OF EVALUATING TEXTURE DATA

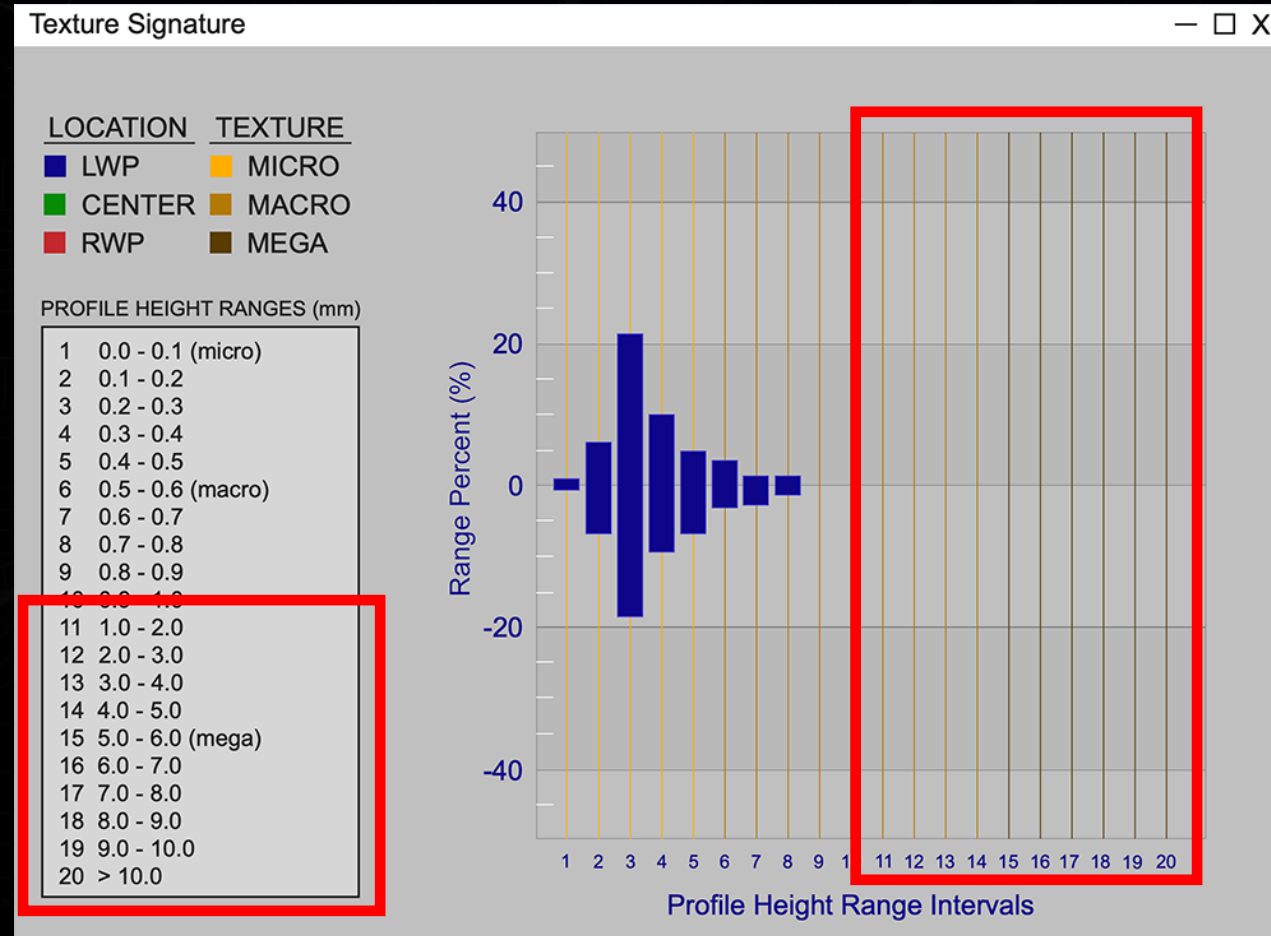
## THE TEXTURE SIGNATURE: 0.1MM INTERVAL BINS





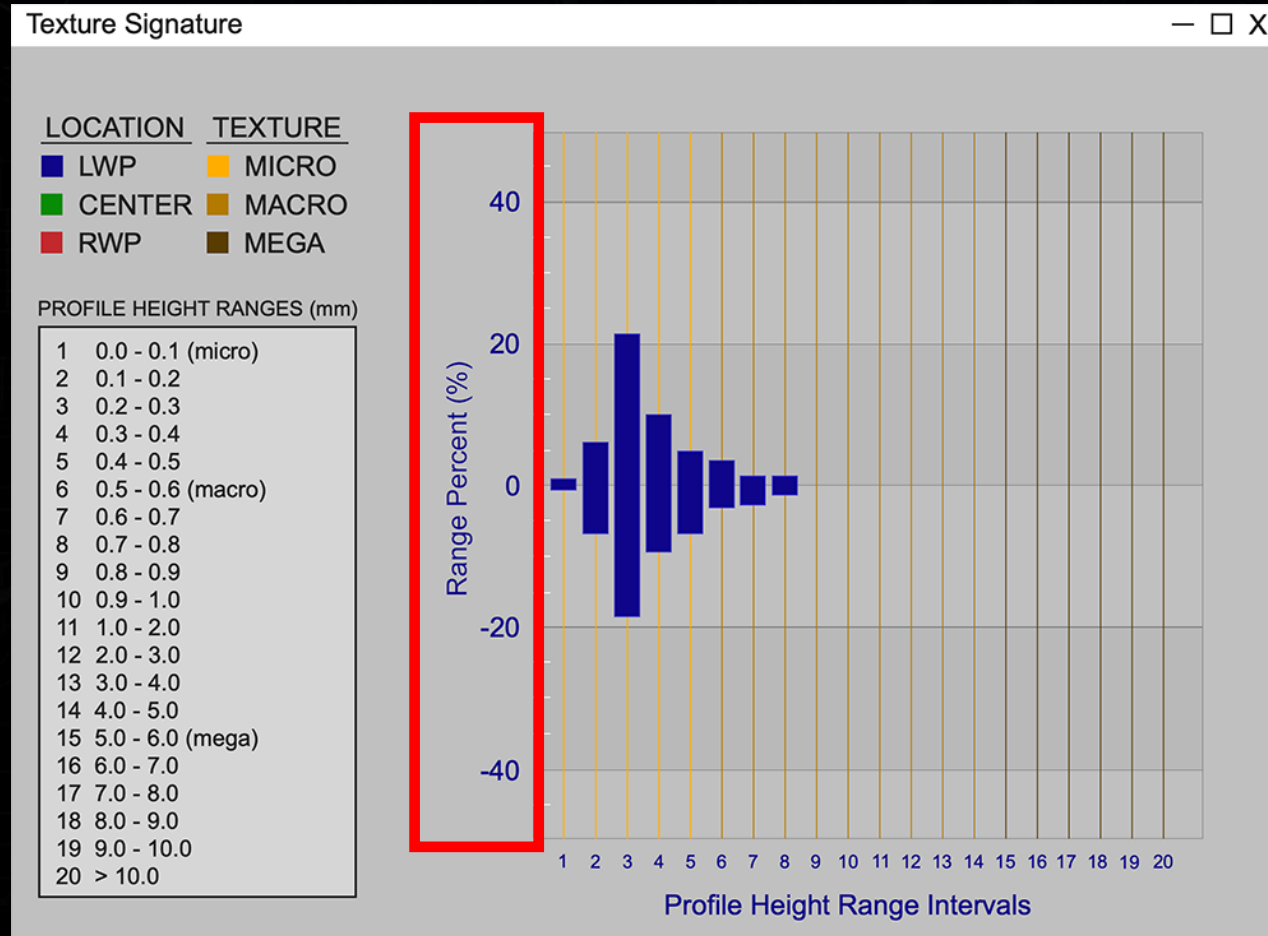
# A NEW WAY OF EVALUATING TEXTURE DATA

## THE TEXTURE SIGNATURE: 1MM INTERVAL BINS



# A NEW WAY OF EVALUATING TEXTURE DATA

## THE TEXTURE SIGNATURE: PERCENTAGE OF DATA PER BIN

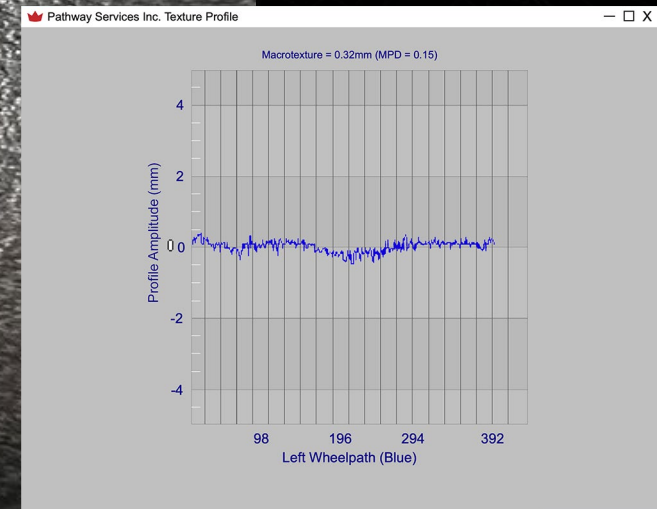




# LAB EXAMPLE 1: TABLETOP SURFACE



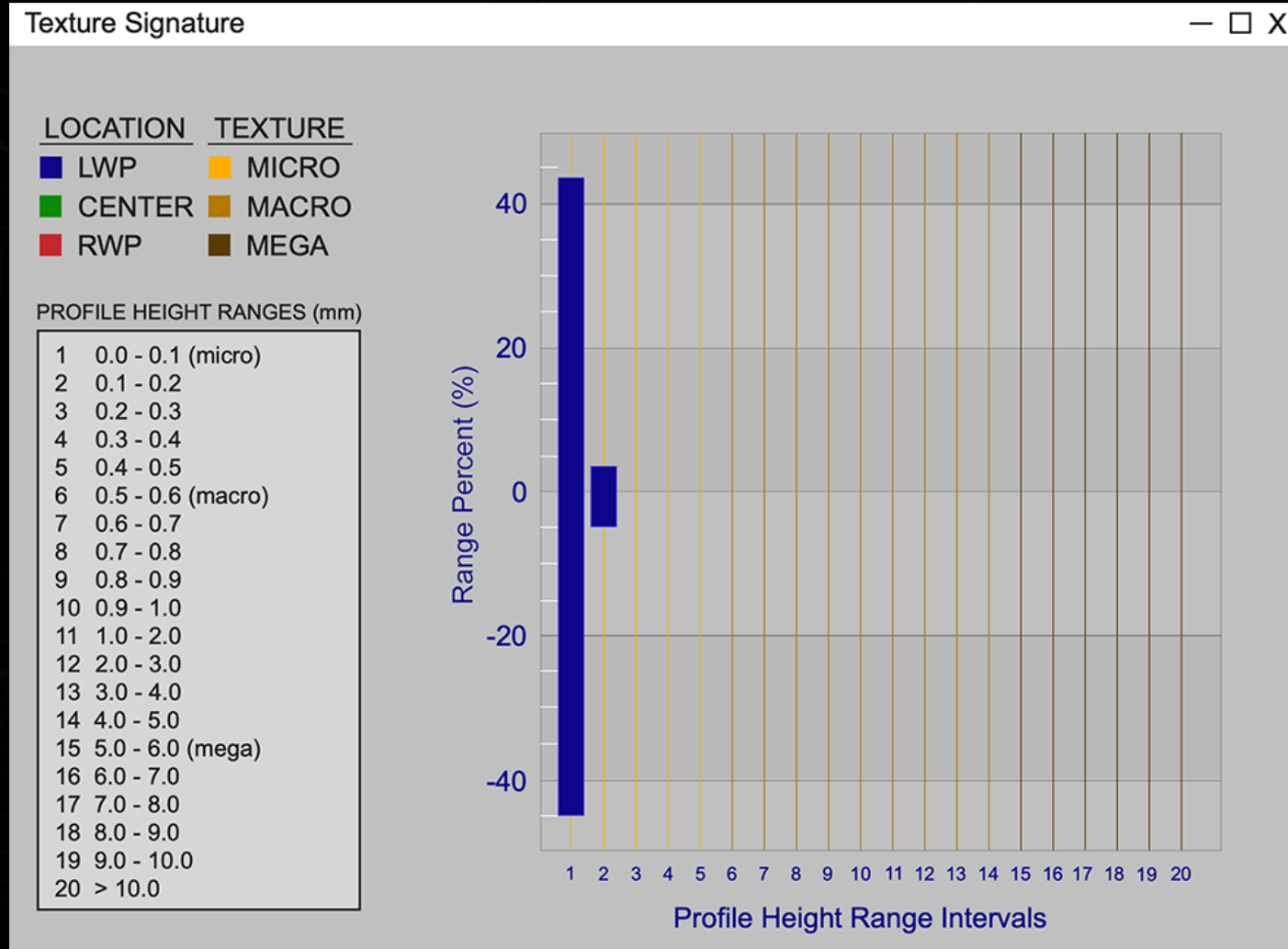
TABLETOP SURFACE



TABLETOP TEXTURE PROFILE



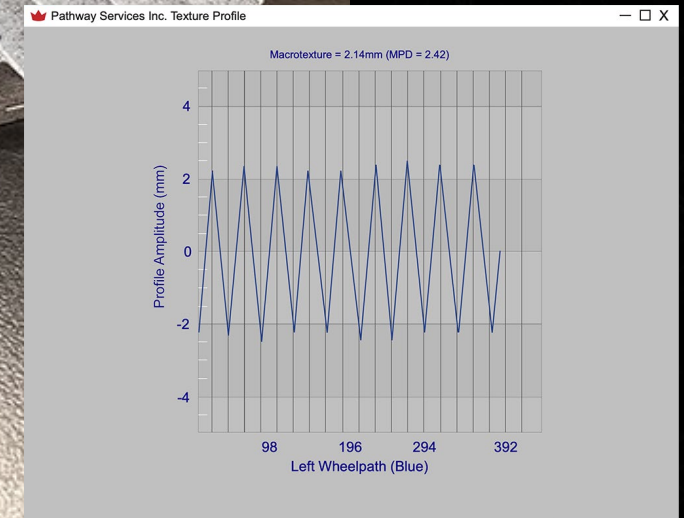
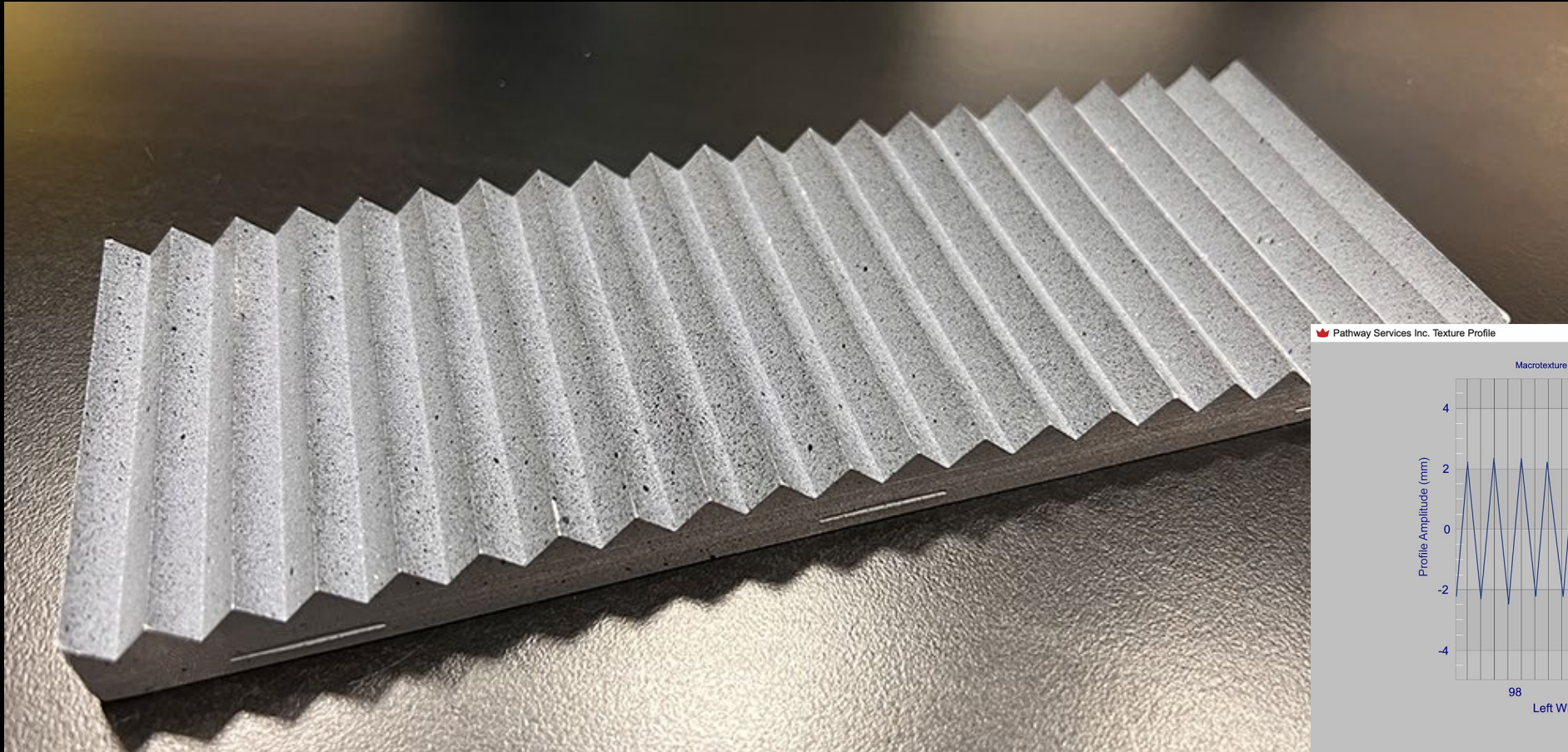
# LAB EXAMPLE 1: TABLETOP SURFACE TEXTURE SIGNATURE



TABLETOP TEXTURE SIGNATURE



## LAB EXAMPLE 2: METAL SAWTOOTH OBJECT

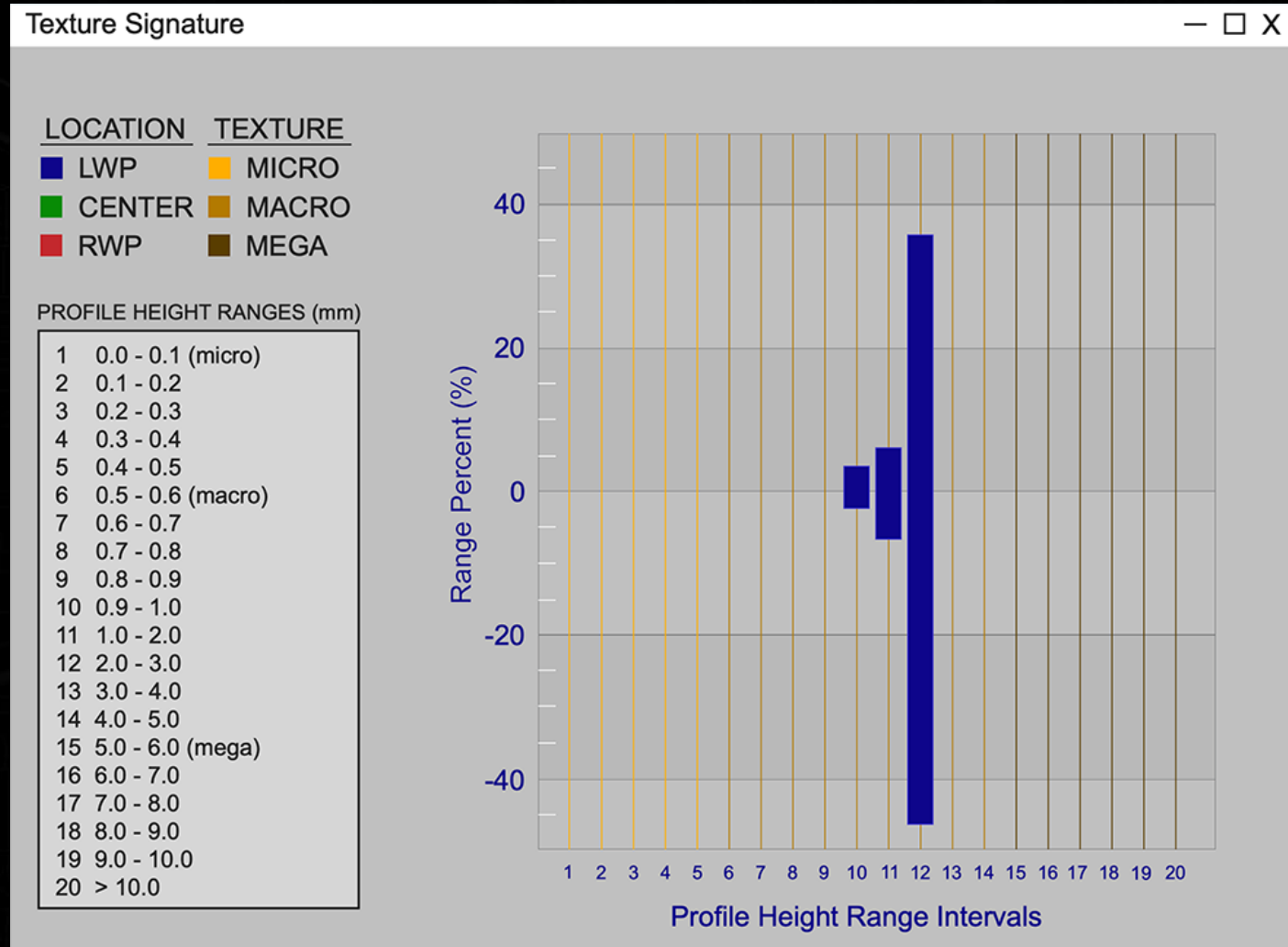


METAL SAWTOOTH OBJECT

SAWTOOTH TEXTURE PROFILE



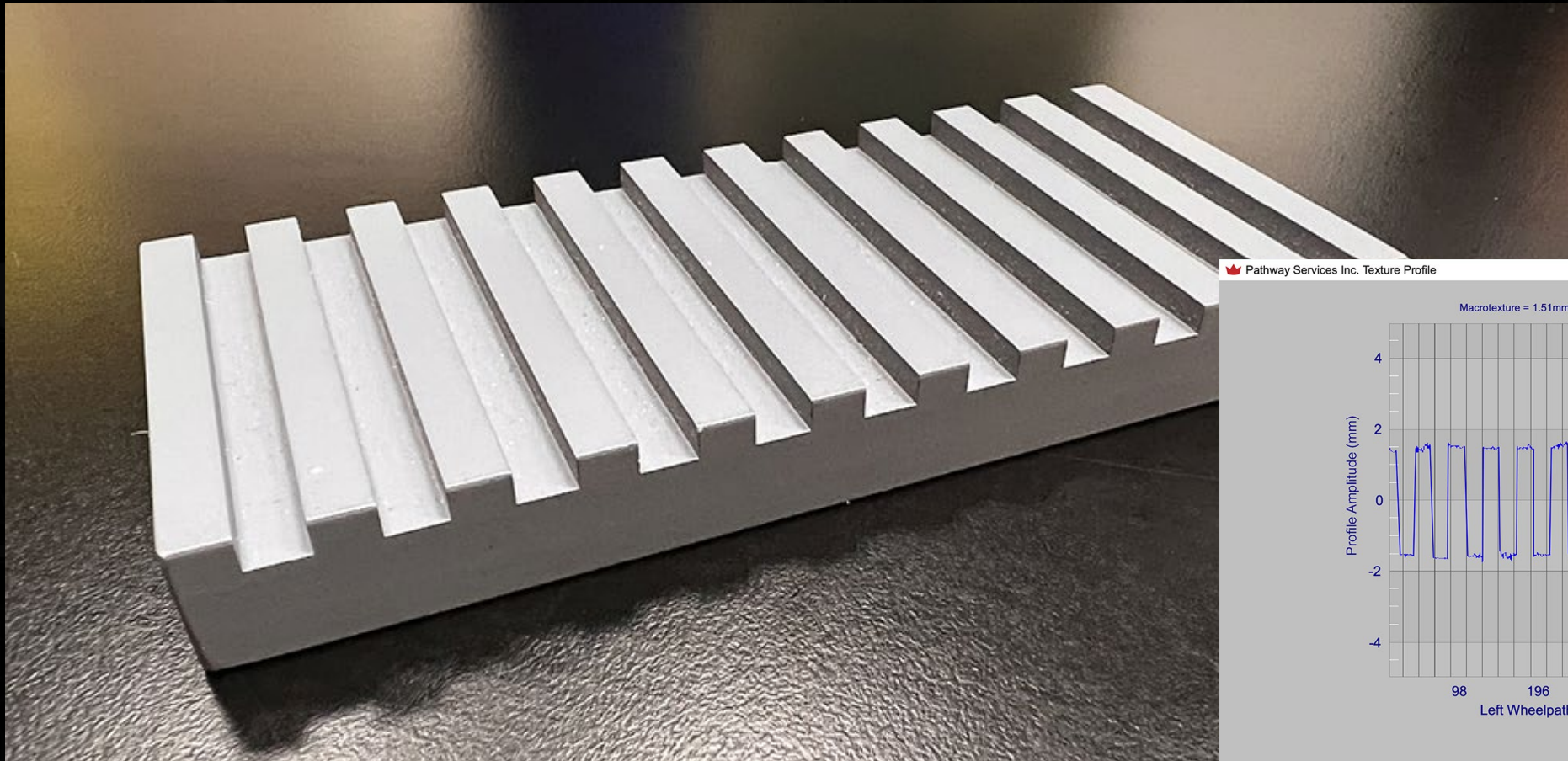
# LAB EXAMPLE 2: METAL SAWTOOTH OBJECT TEXTURE SIGNATURE



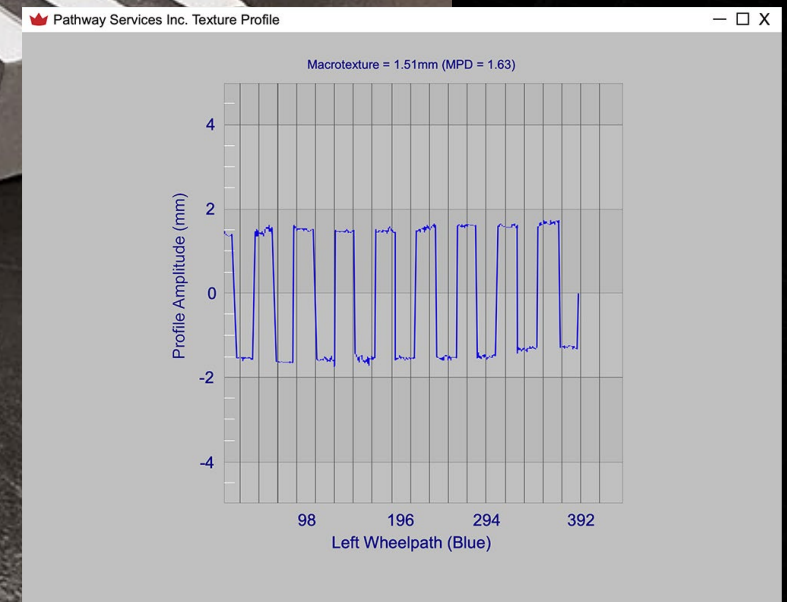
SAWTOOTH TEXTURE SIGNATURE



## LAB EXAMPLE 3: METAL SQUARETOOTH OBJECT

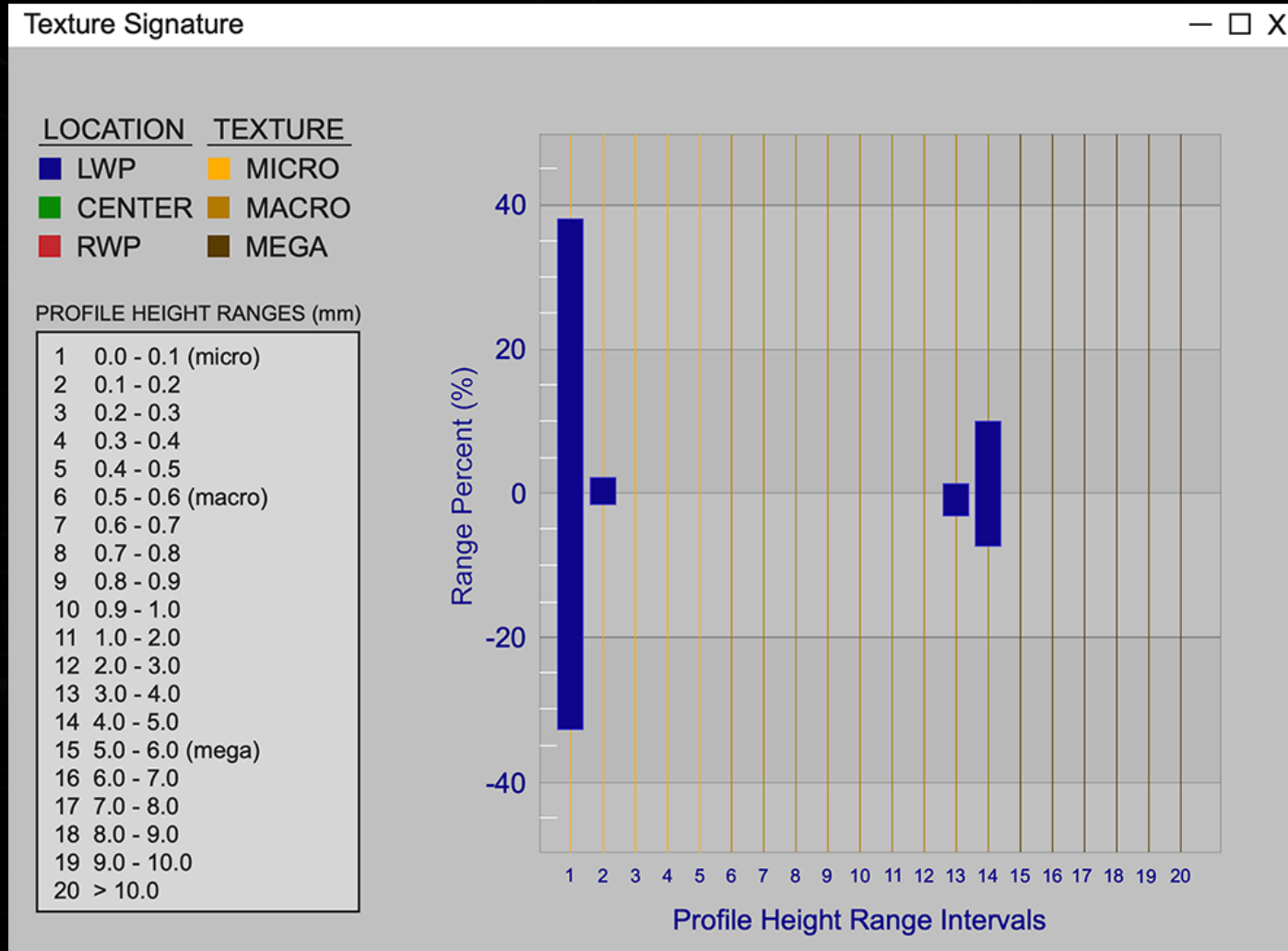


METAL SQUARETOOTH OBJECT



SQUARETOOTH TEXTURE PROFILE

# LAB EXAMPLE 3: METAL SQUARETOOTH OBJECT TEXTURE SIGNATURE

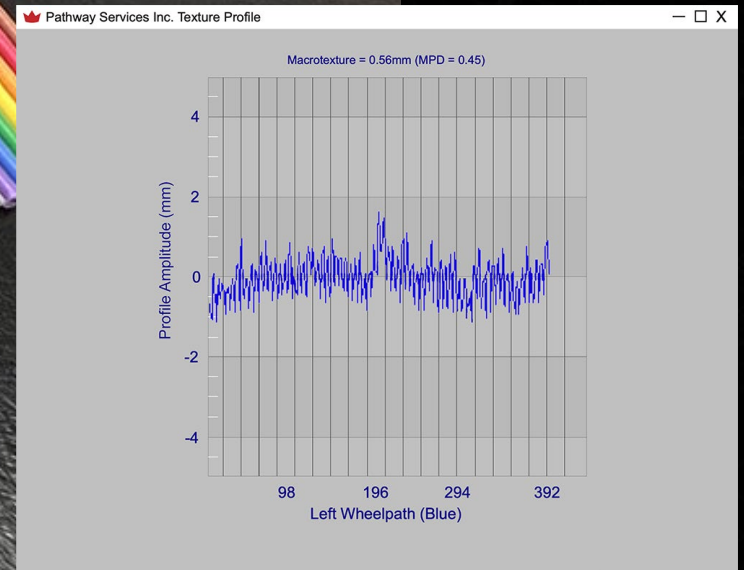




## LAB EXAMPLE 4: WIRE RIBBON



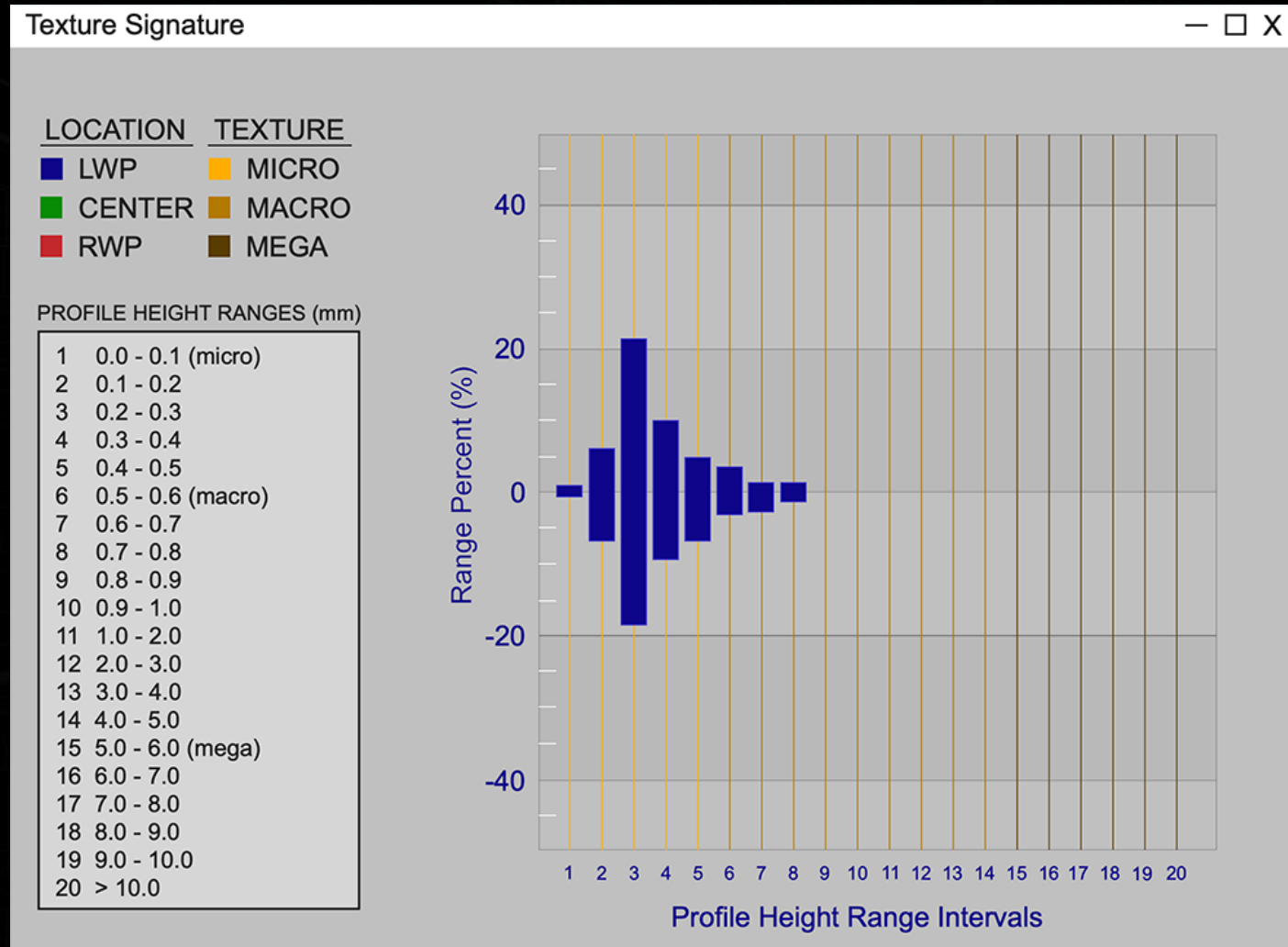
WIRE RIBBON



WIRE RIBBON TEXTURE PROFILE



# LAB EXAMPLE 4: WIRE RIBBON TEXTURE SIGNATURE





# OHIO DEPARTMENT OF TRANSPORTATION CORE SAMPLES



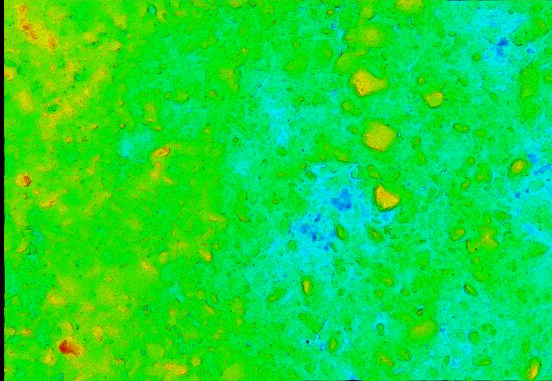


# OHIO DEPARTMENT OF TRANSPORTATION CORE SAMPLES

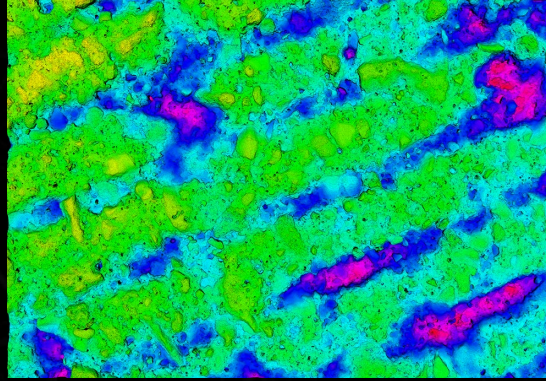
**SKID NUMBER  
MPD**



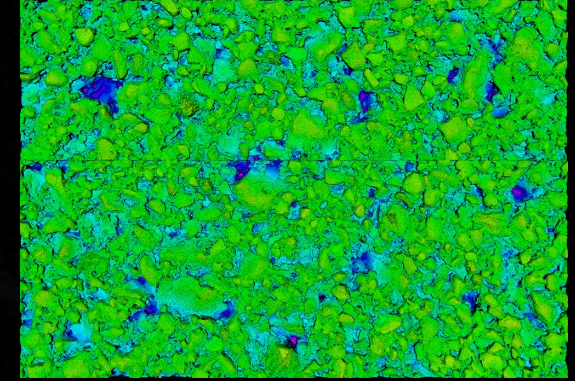
# OHIO DEPARTMENT OF TRANSPORTATION CORE SCANS



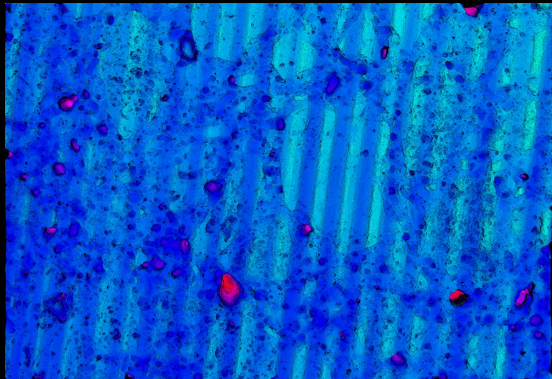
*Polished Microsurfacing*



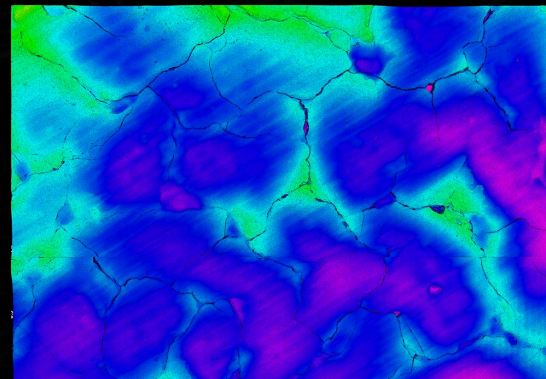
*Worn Jointed Concrete*



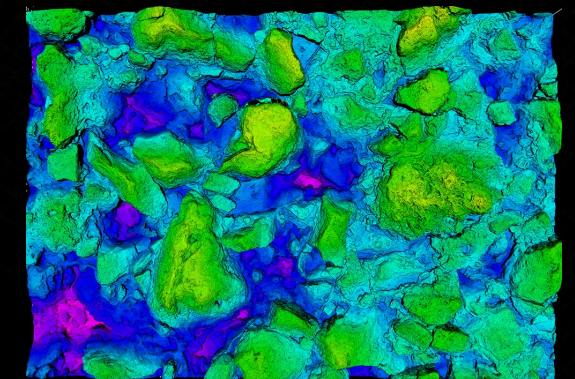
*Hot Mix Asphalt*



*Diamond Ground Concrete*



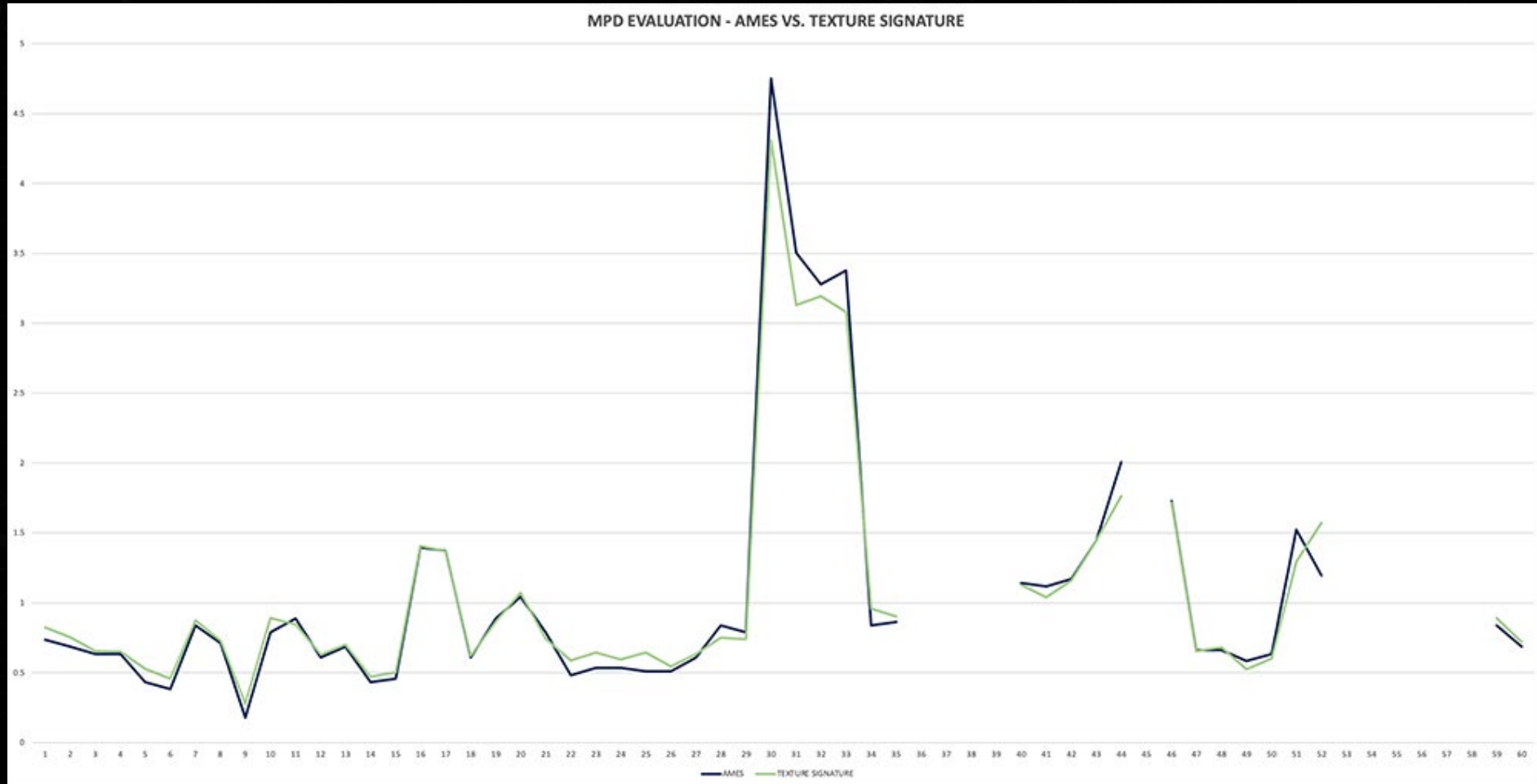
*Jennite*



*Chip Seal*



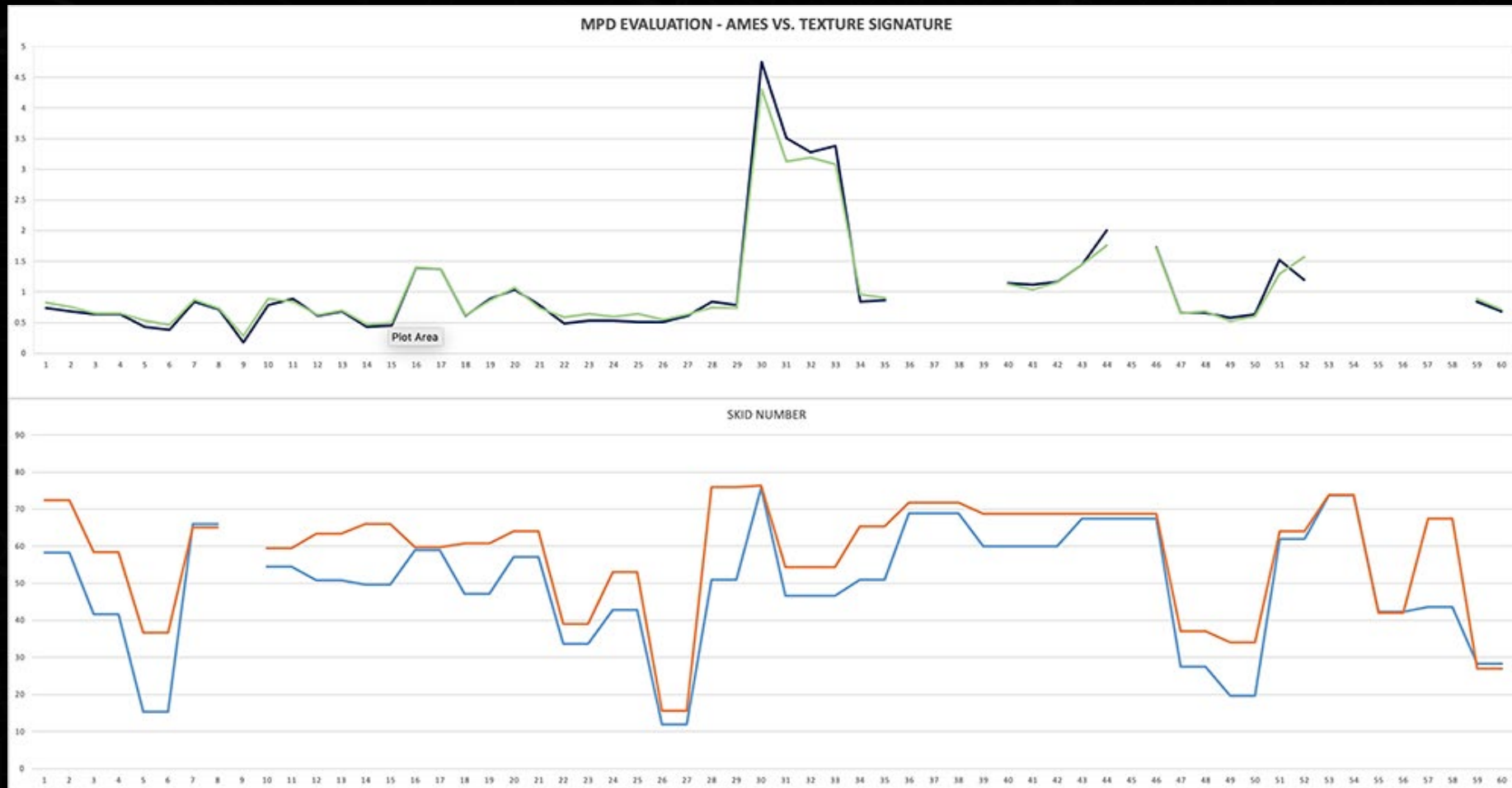
# MPD COMPARISON – TEXTURE SIGNATURE vs. AMES 9400HD



**99.4% CORRELATION**



# TEXTURE SIGNATURE MPD, AMES MPD & SKID NUMBER



**41% CORRELATION TO SMOOTH TIRE SN**

**27% CORRELATION TO RIBBED TIRE SN**

# "AH HA" MOMENT

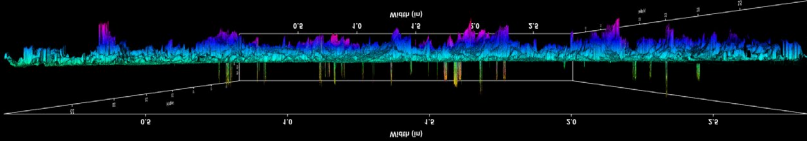


**MPD IS FLAT**

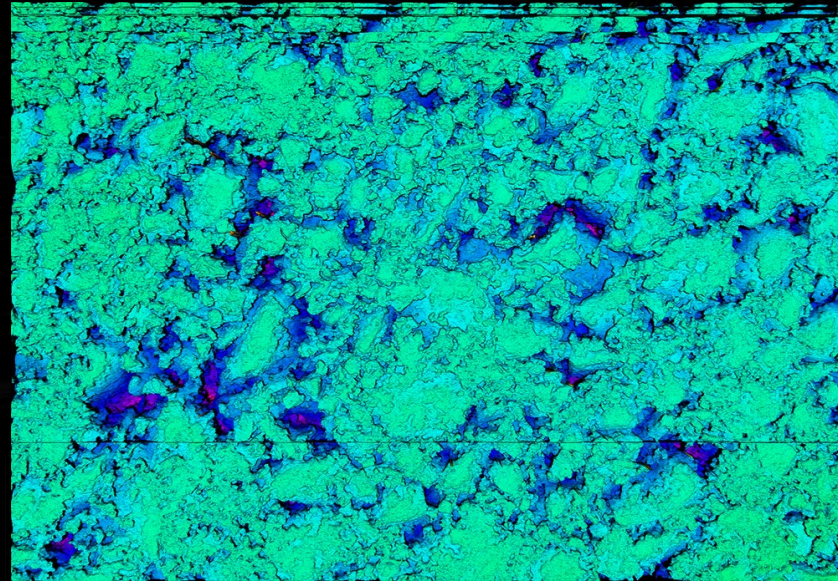
**SKID NUMBER VARIES SIGNIFICANTLY**



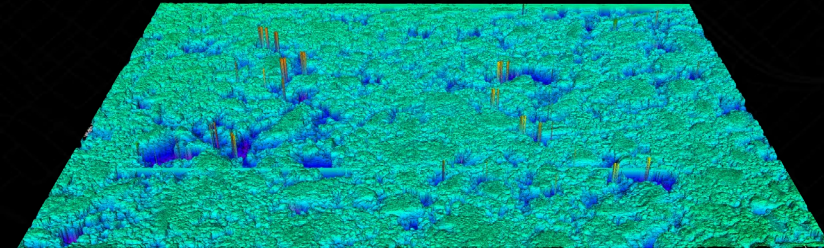
**COARSE LIMESTONE AGGREGATE**  
**MPD: 0.647**



SIDE



TOP

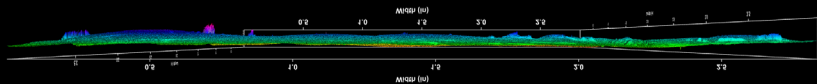


ANGLED

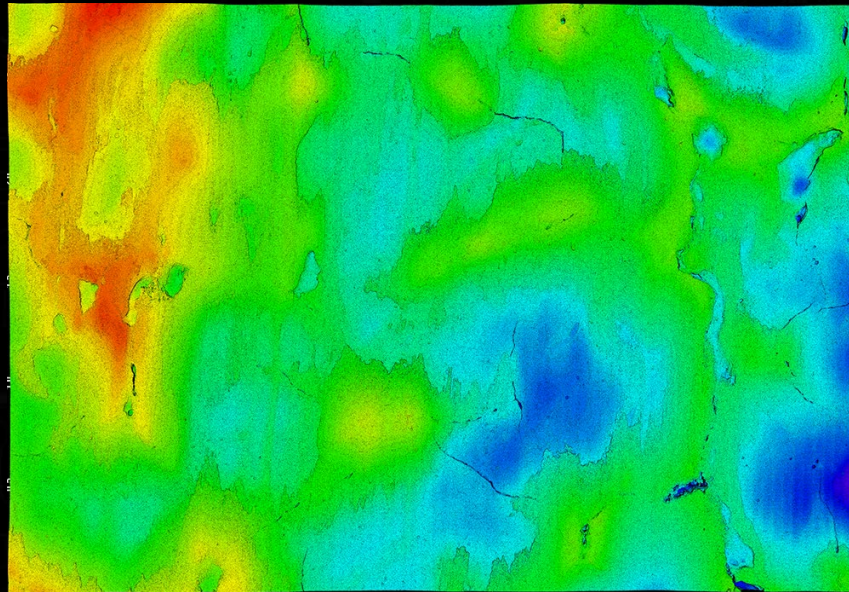


# ODOT CORE 26

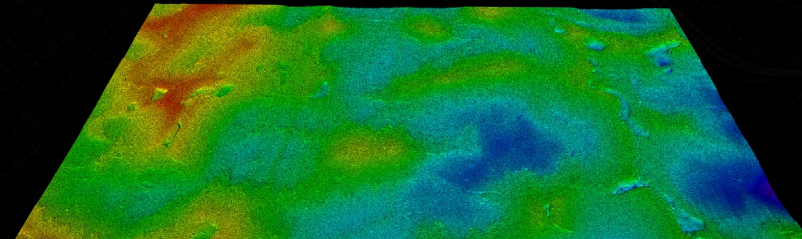
**JENNITE**  
**MPD: 0.546**



SIDE



TOP

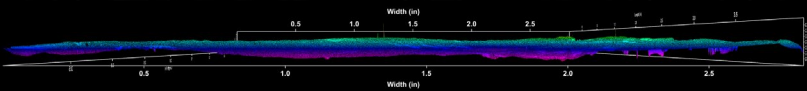


ANGLED

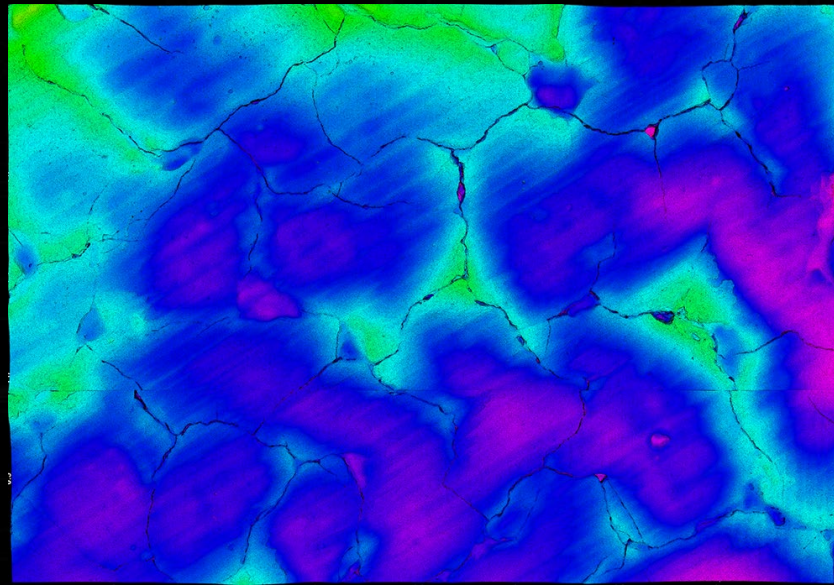


# ODOT CORE 27

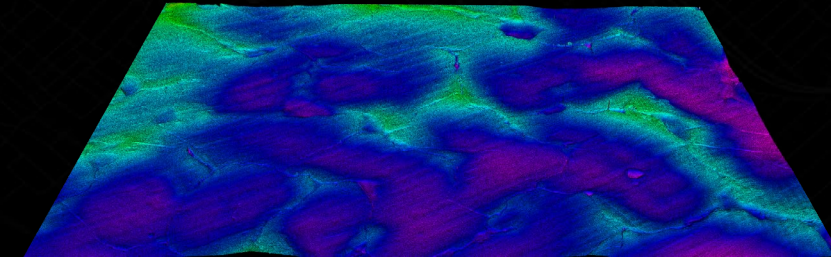
**JENNITE**  
**MPD: 0.658**



SIDE

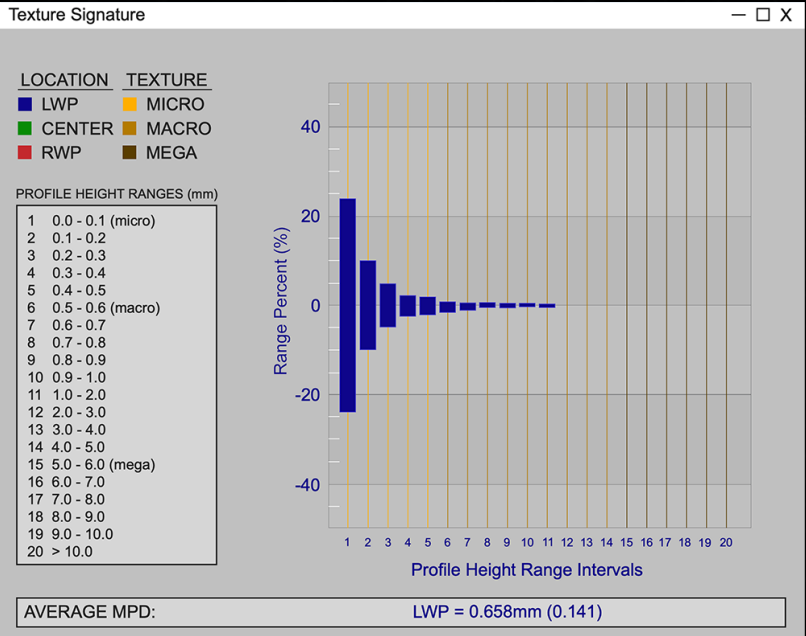
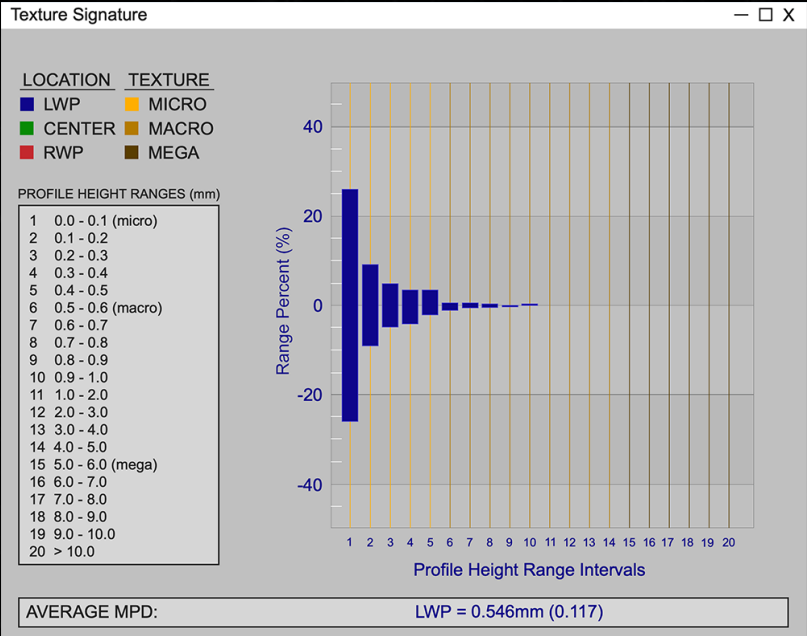
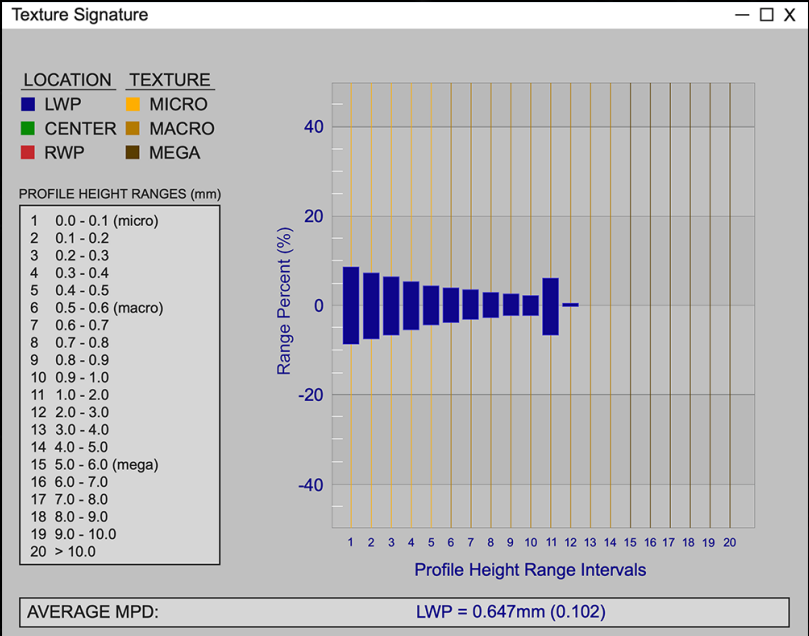


TOP

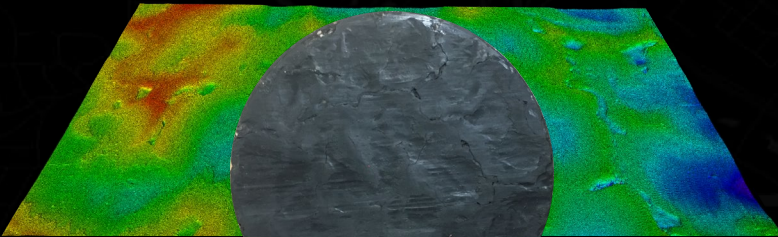


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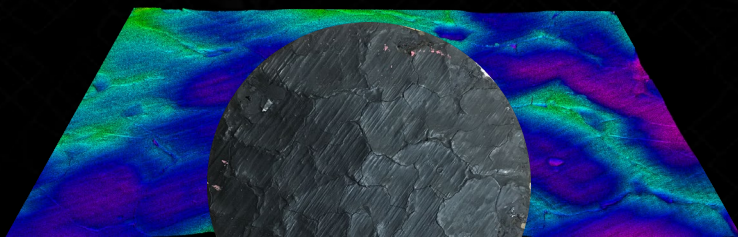
# TEXTURE SIGNATURE COMPARISON WITH EQUIVALENT MPDs



CORE 25



CORE 26



CORE 27



## RESEARCH PROJECT GOAL

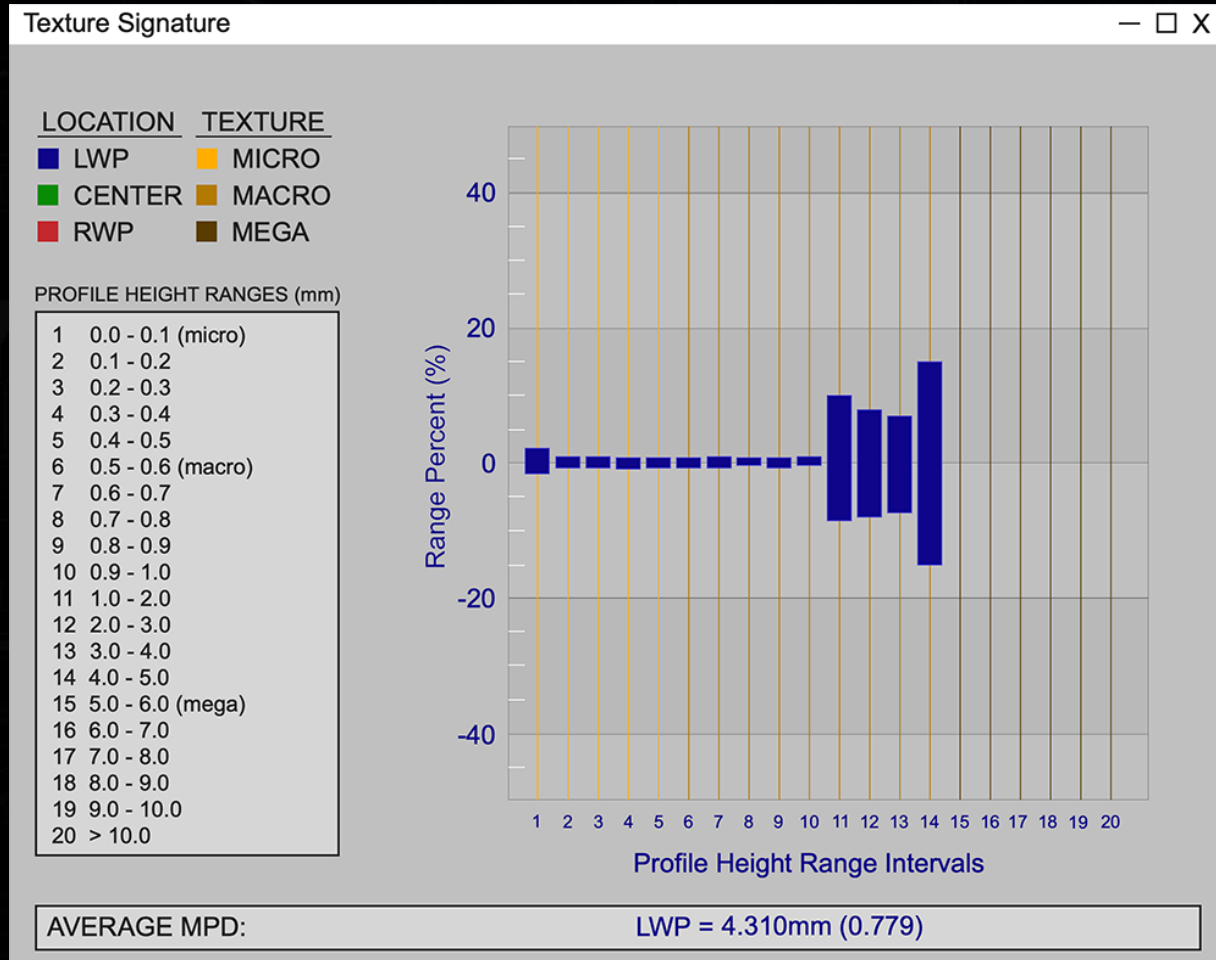
***FIND A METHOD TO COLLECT  
NETWORK LEVEL TEXTURE DATA  
THAT IS A BETTER PREDICTOR OF  
SKID NUMBER THAN MPD.***

## THE “TEXTURE SIGNATURE NUMBER”

- THE **TEXTURE SIGNATURE NUMBER** IS MORE CONSUMABLE
- THE **TEXTURE SIGNATURE NUMBER** IS A SINGLE VALUE THAT CAN BE CORRELATED WITH SKID NUMBER
- THE **TEXTURE SIGNATURE NUMBER** PROVIDES PROGRAMATIC CONTROL TO POSITIVELY AND NEGATIVELY WEIGHT BINS THAT DRAMATICALLY AFFECT SKID NUMBER



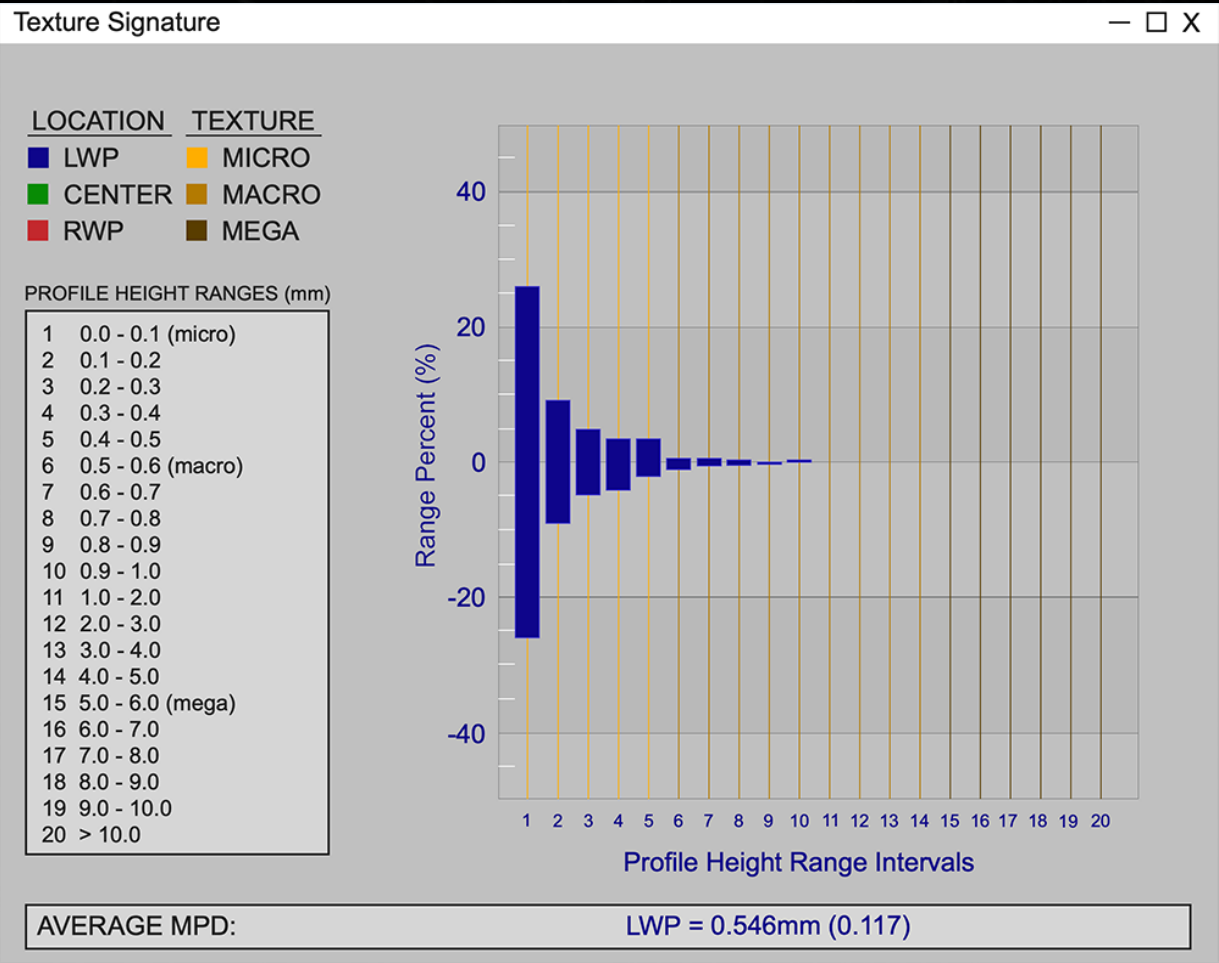
# COARSENESS POSITIVELY AFFECTS SKID NUMBER



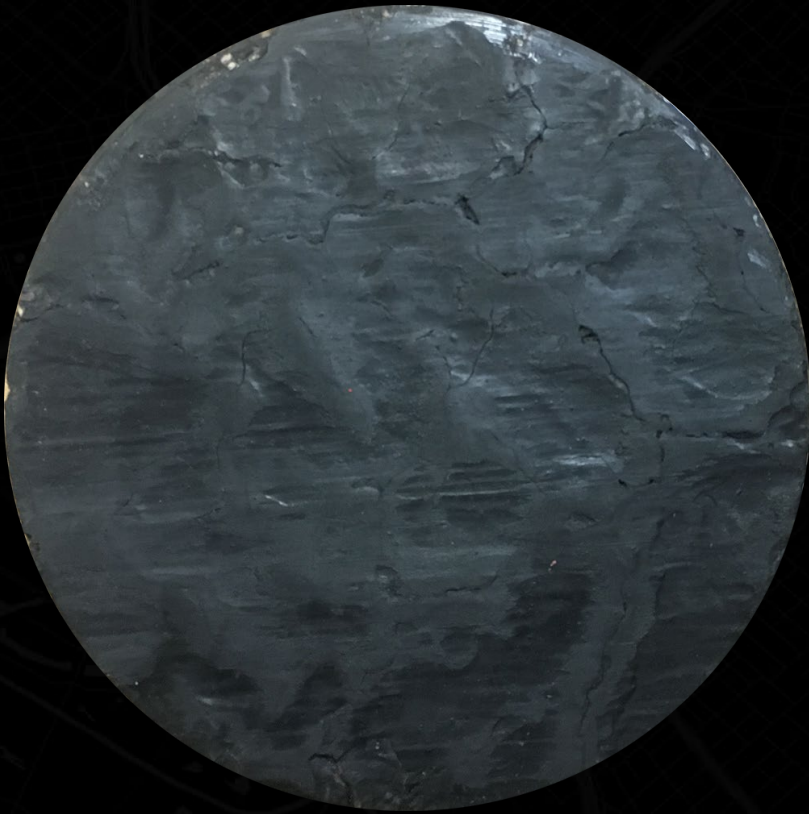
CORE 30



# SMOOTHNESS NEGATIVELY AFFECTS SKID NUMBER

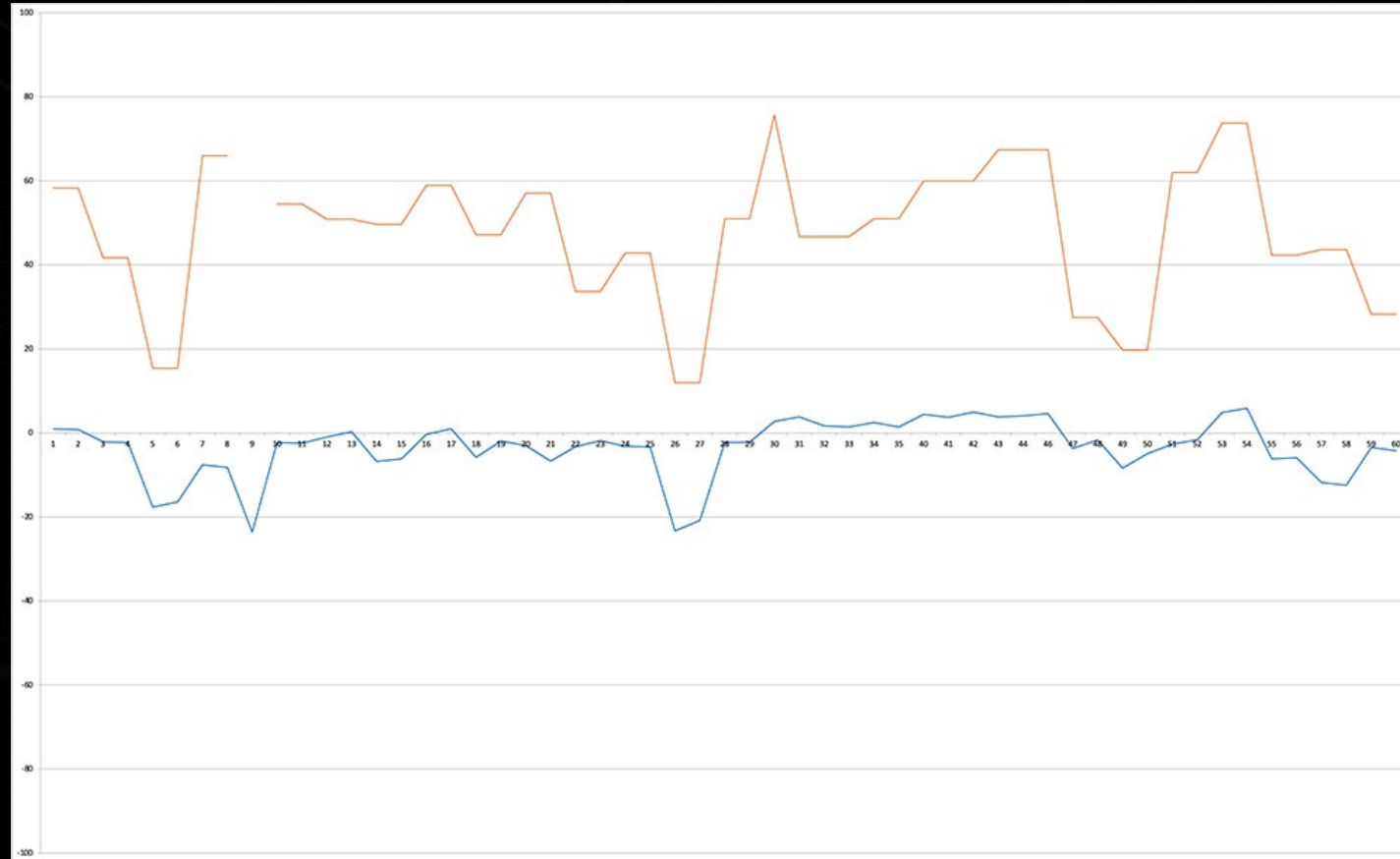


CORE 26





# THE "TEXTURE SIGNATURE NUMBER" TRENDS WITH SKID NUMBER



SN

TSN

# THE "TEXTURE SIGNATURE NUMBER" PERFORMANCE vs. MPD

## % CORRELATION WITH SKID NUMBER

|                            | MPD               | TEXTURE<br>SIGNATURE<br>NUMBER |
|----------------------------|-------------------|--------------------------------|
| RIBBED TIRE<br>SKID NUMBER | 27%<br>NEGLIGIBLE | 64%<br>MODERATE                |
| SMOOTH TIRE<br>SKID NUMBER | 41%<br>LOW        | 71%<br>HIGH                    |



# THE TEXTURE SIGNATURE SYSTEM

- **5000x** THE AMOUNT OF DATA AT **5x** THE RESOLUTION
- **COLLECTING EVERY 1/3"**: ½ MILLION DATA POINTS vs. 100 in 10M
- **BINNING ALL** THE COLLECTED DATA
- **NETWORK LEVEL REPORTING** – USER DEFINABLE INTERVALS
- **DATA** CAN BE **SPATIALLY PLOTTED**
- **REDUCED DATA COLLECTION COSTS** vs. SKID TESTING
- **PROACTIVELY TRACK TEXTURE CHANGES** OVER TIME / ANNUALLY

THERE'S MORE TO THE TEXTURE SIGNATURE SYSTEM

## THREE ZONE DATA COLLECTION



LEFT WHEELPATH

CENTER OF THE LANE

RIGHT WHEELPATH



# THREE ZONE DATA COMPARISONS

