

# BNSF Track Measurement Program

Charity Duran, Director of Data Engineering & Analysis



HEAVY HAUL SEMINAR • JUNE 8 - 9



WRI 2023

# BNSF Track Measurement Vision

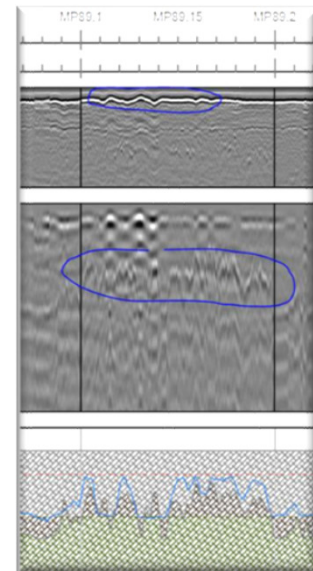
*BNSF's Track Measurement Team is committed to testing track infrastructure using innovative technologies and providing the most accurate measurements possible. We will ensure our infrastructure is in safe operating condition and in compliance with regulations. We will generate the highest quality data possible to discover insights and build data-driven maintenance plans. This will help BNSF to achieve its vision and maintain industry leadership.*



# BNSF Track Measurement Program

## Attended Fleet

- 2 Railbound Attended Cars
  - Track Geometry, Rail Wear, THOR, GPR
- 6 BNSF Hyrails



HEAVY HAUL SEMINAR • JUNE 8 - 9

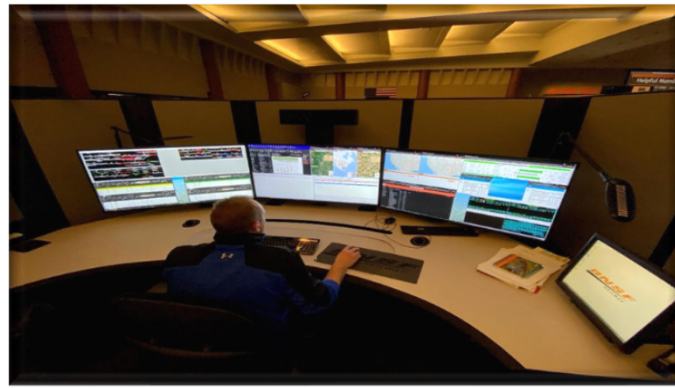
**BNSF**  
RAILWAY

**WRI 2023**

# BNSF Track Measurement Program

## Unattended Fleet

- 4 Unattended Railbound Cars
  - Track Geometry
- 52 VTI Equipped Locomotives



HEAVY HAUL SEMINAR • JUNE 8 - 9

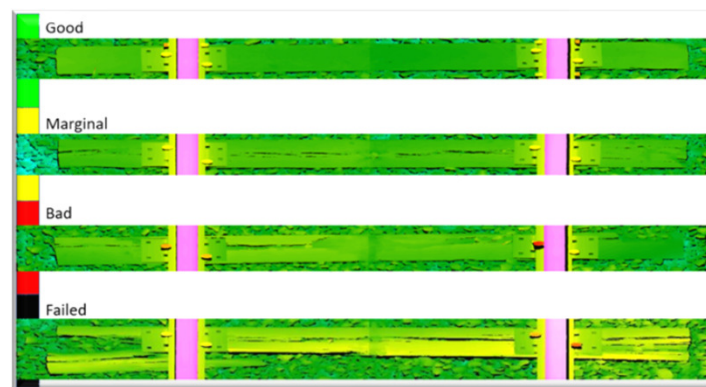
**BNSF**  
RAILWAY

**WRI 2023**

# BNSF Track Measurement Program

## Other Track Inspection Systems

- Tie Condition
- Rail Flaw

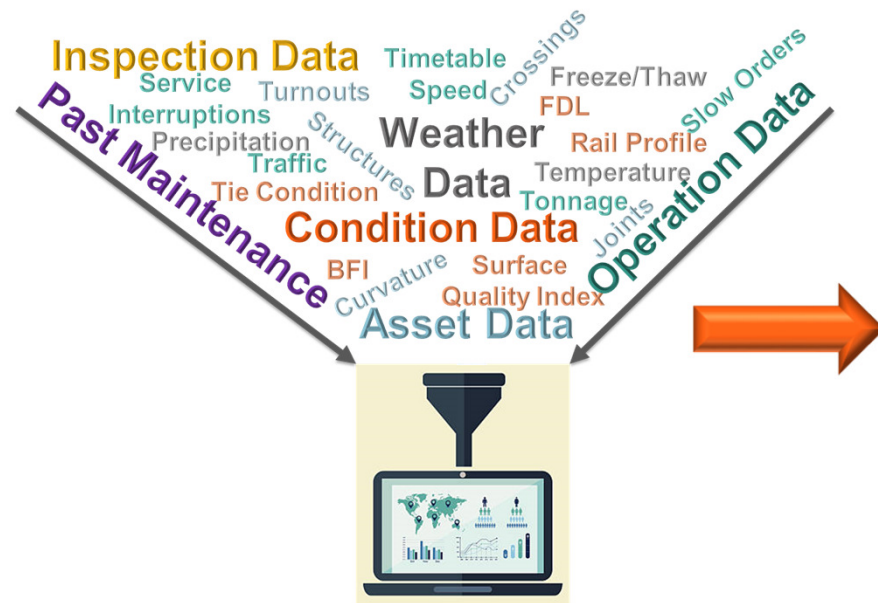


HEAVY HAUL SEMINAR • JUNE 8 - 9

**BNSF**  
RAILWAY

**WRI 2023**

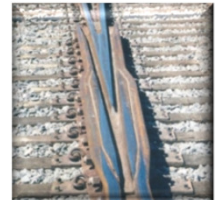
# From Data to Information



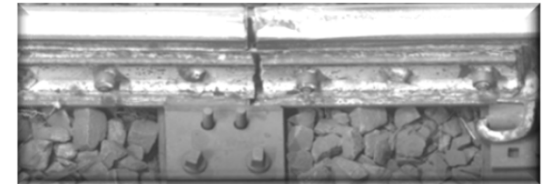
**Degradation Rates**



**Component Life Cycles**







**Root Cause Analysis**



# Data Quality

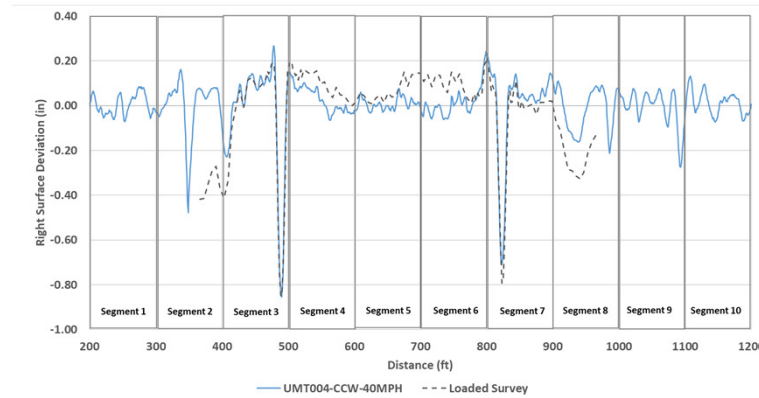
- Data accuracy, repeatability, and reproducibility are very important
  - BNSF regularly assesses track measurement vehicle

	Accurate	Inaccurate (systematic error)
Precise Precision - Repeatable & Reproducible		
Imprecise Imprecise - Not Repeatable Not Reproducible		



# R&R Tests

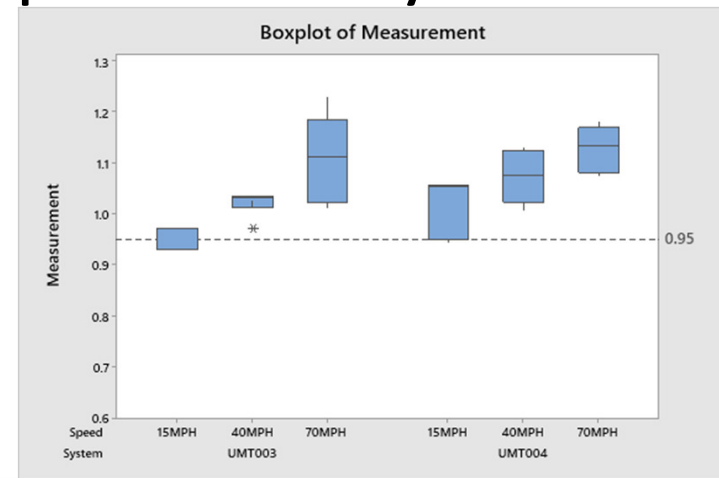
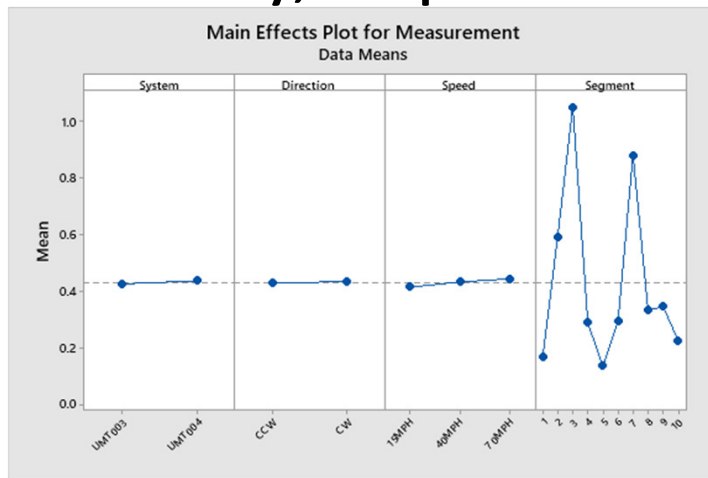
- Track Measurement Vehicles are tested over known deviations in track
  - Different direction
  - Speed
  - Different measurement systems
- Data is compared to “Ground Truth”





# Example of Assessment

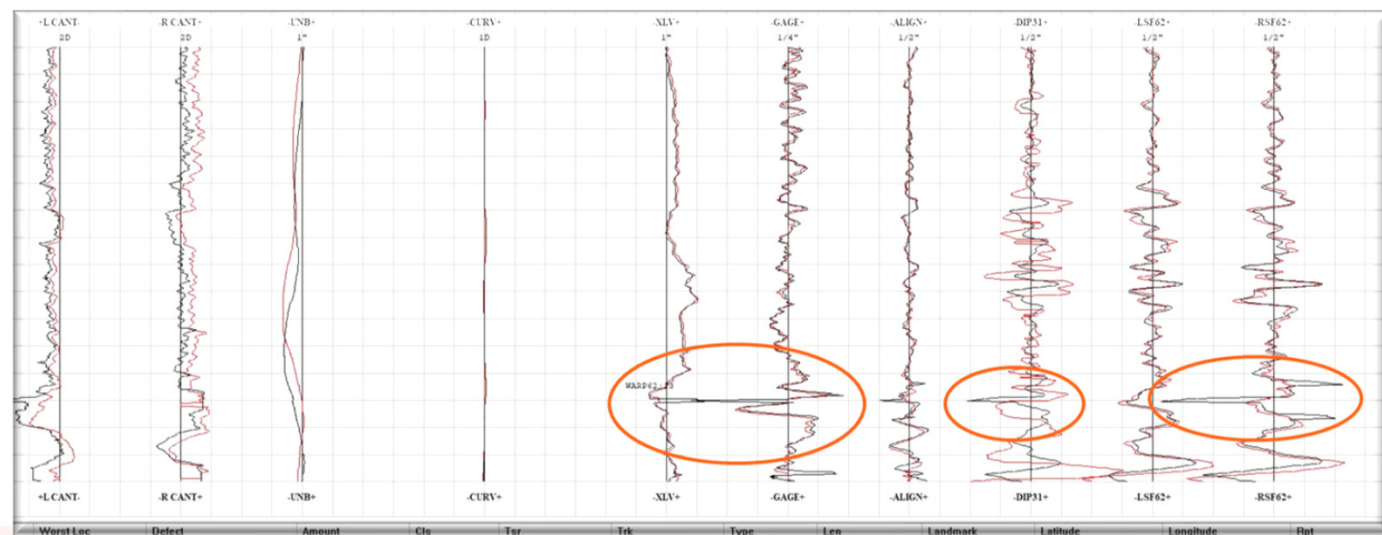
- Data is compared to ground truth survey
  - Determine source of variation if any
  - Accuracy, Repeatability, Reproducibility



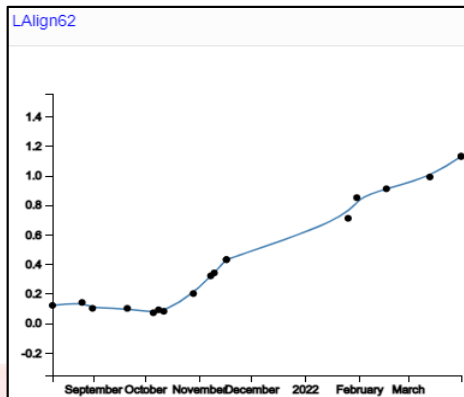
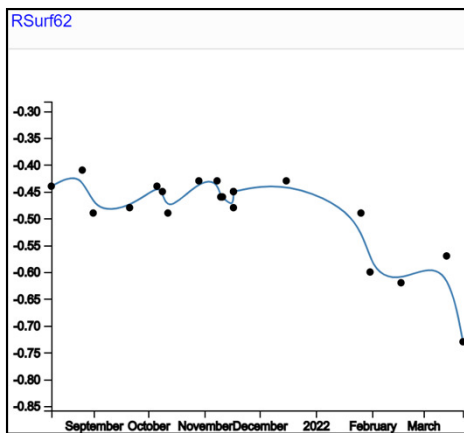
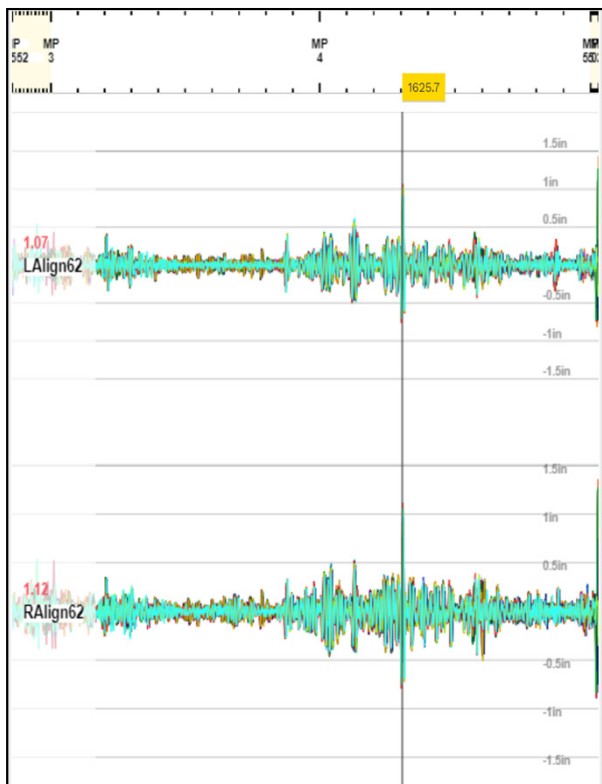
# Data Quality Audits

- Audits are performed daily by personnel on Track Geometry Desk

- Spikes
- Offsets



# From Data to Information to Data-Driven Maintenance



- Questions?



HEAVY HAUL SEMINAR • JUNE 8 - 9

**BNSF**  
RAILWAY

**WRI 2023**