

# BART Wheel / Rail Optimization

*Prepared for the Board of Directors  
November 15, 2018*



**Gregory Shivy**

*Principal Track Engineer, M&E*

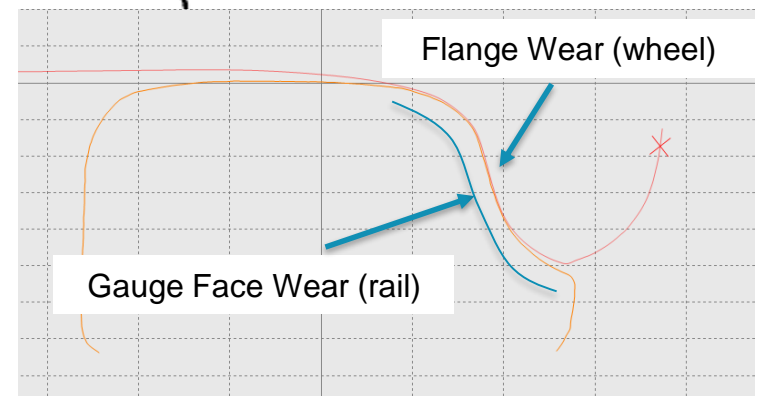
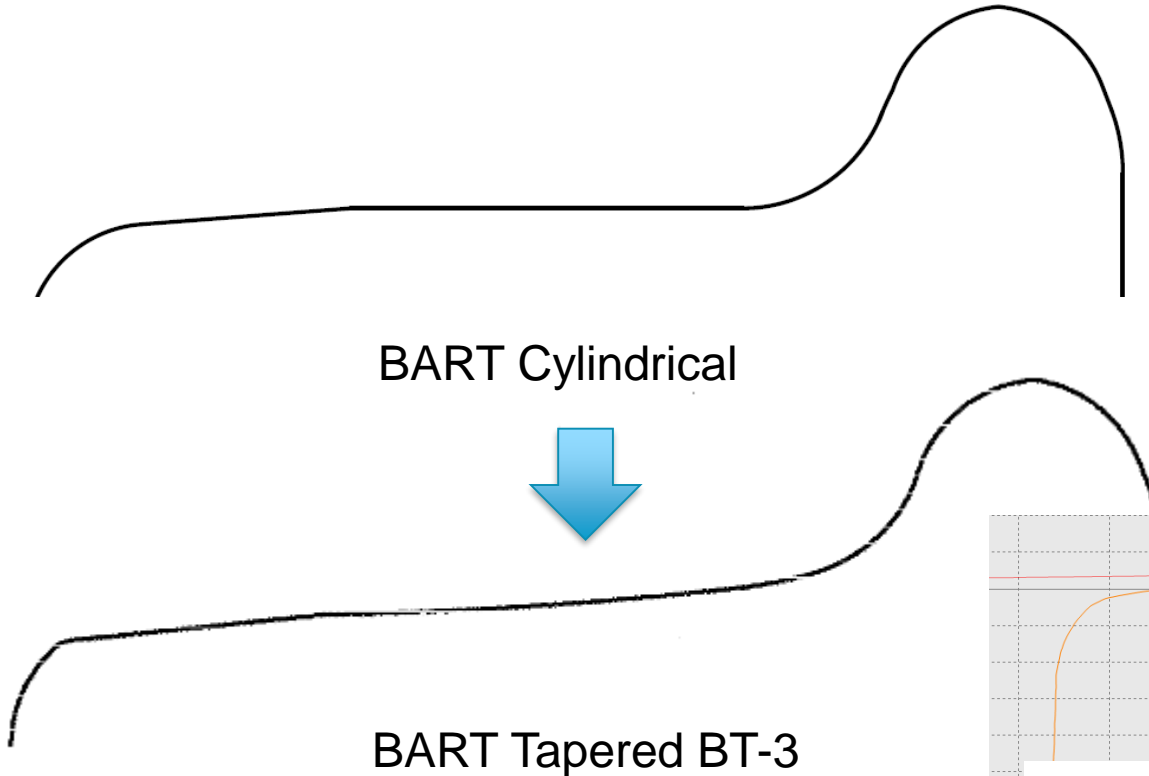
**Charles Franz**

*Vehicle Systems Engineer, RS&S*



# BART Wheel / Rail Optimization

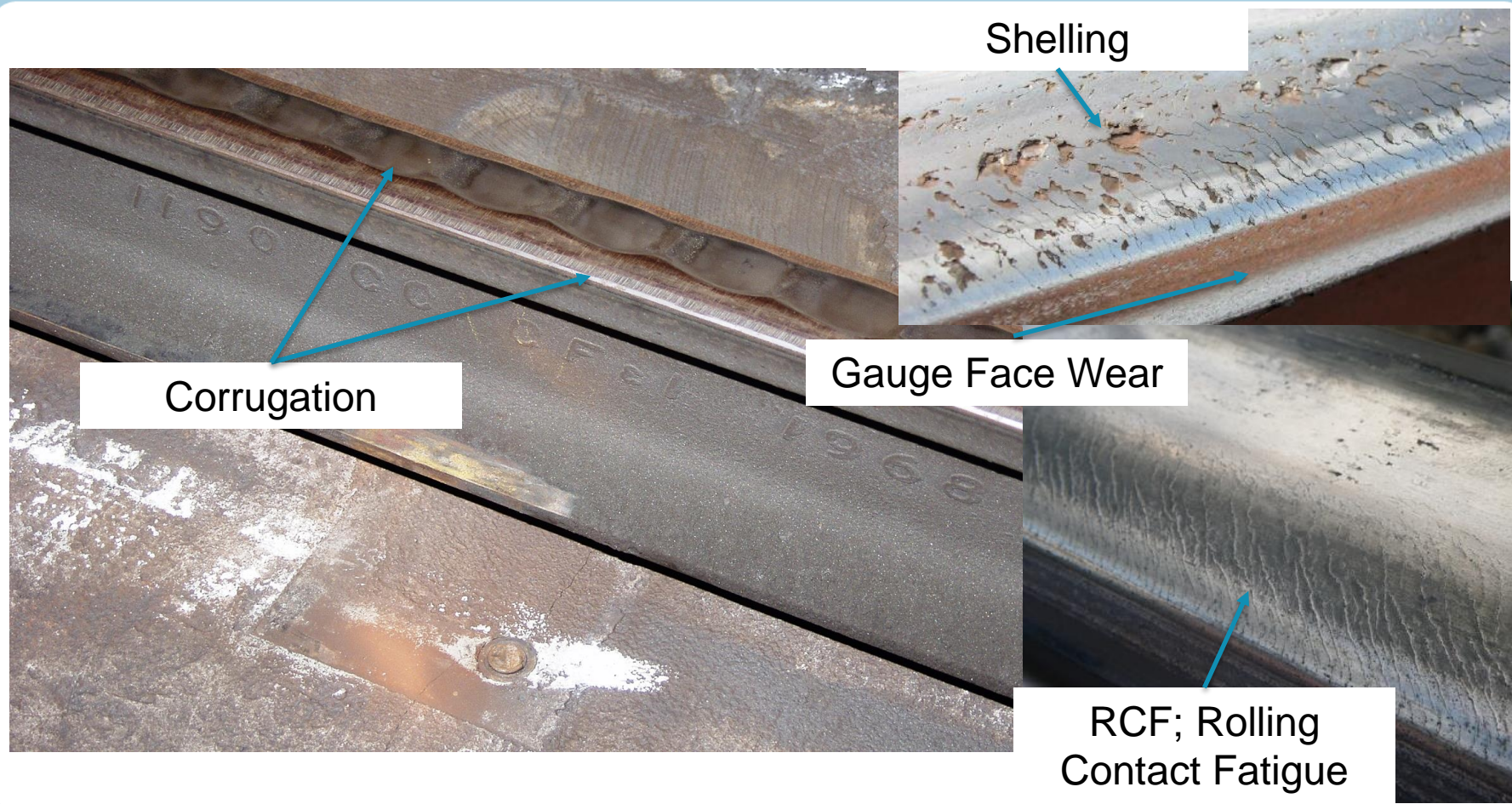
## *Conversion Recap*





# BART Wheel / Rail Optimization

## *Damage Mechanisms*

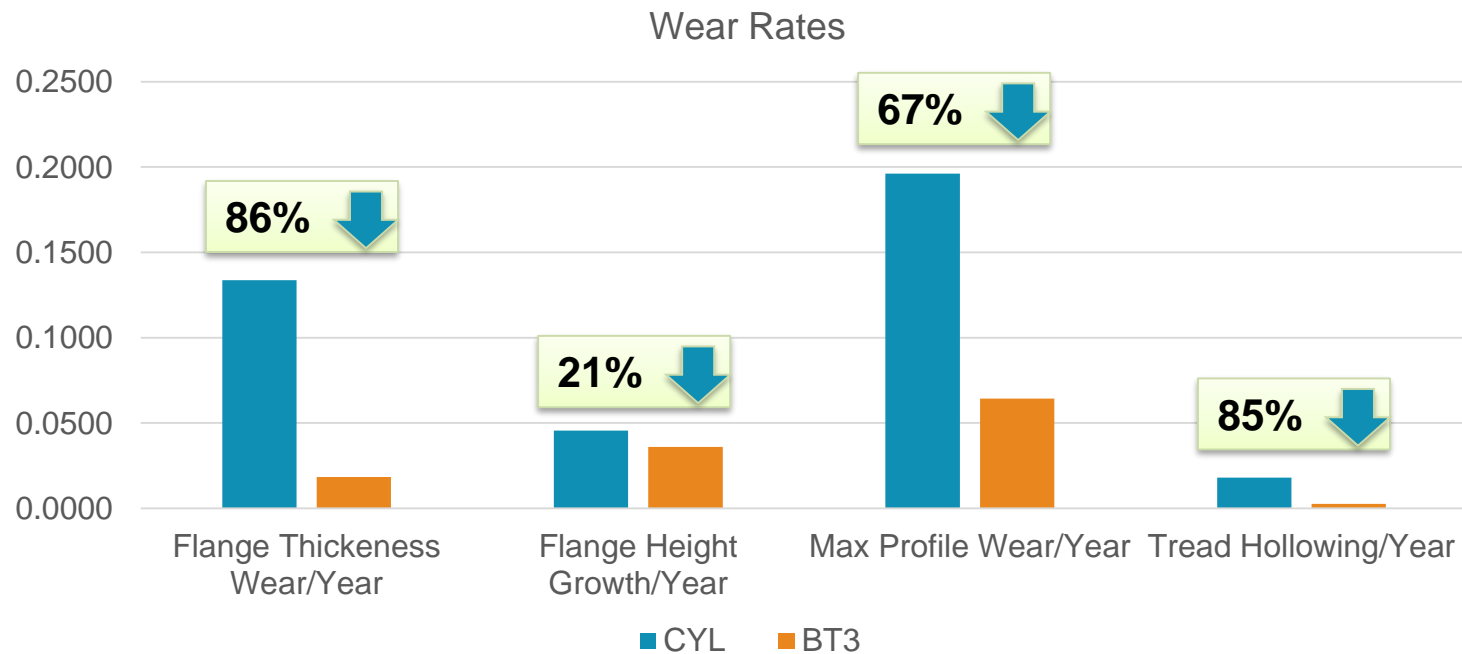


# BART Wheel / Rail Optimization

## Wheel Conversion Effort

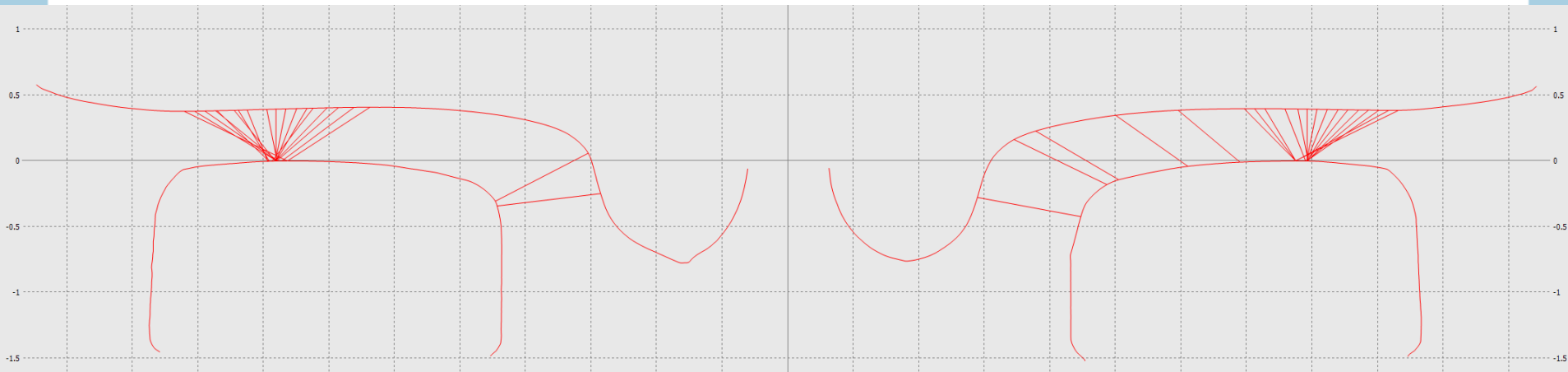
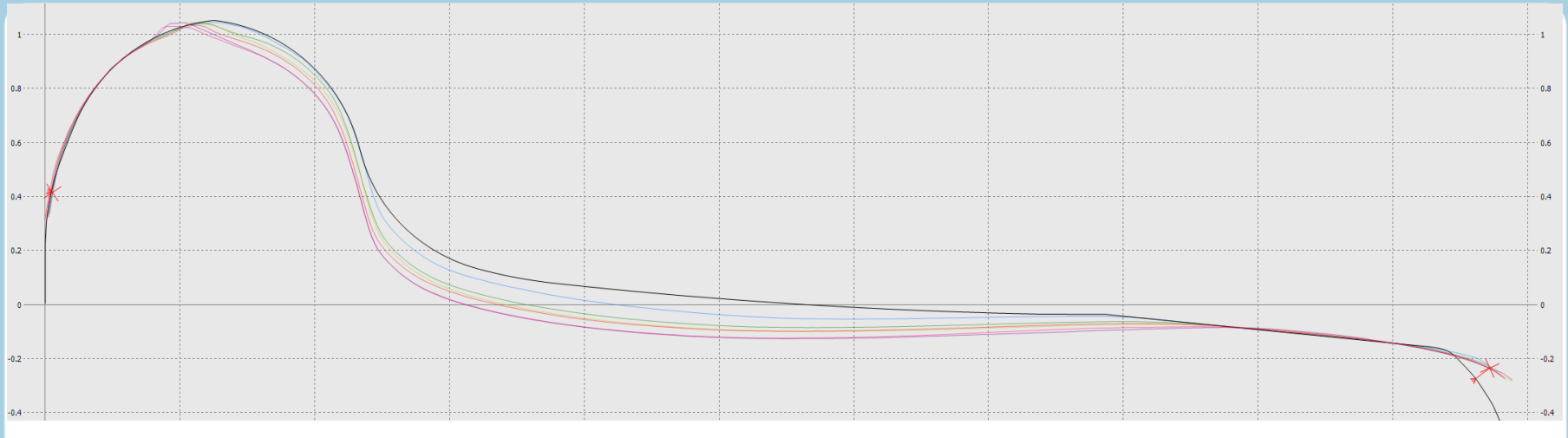


- 634 Cars Converted, 95% of fleet
- Monitoring 25 cars for profile wear patterns.



# BART Wheel / Rail Optimization

## *Wheel Monitoring – Profile Contacts*



# BART Wheel / Rail Optimization

## Wheel Monitoring – Ride Quality



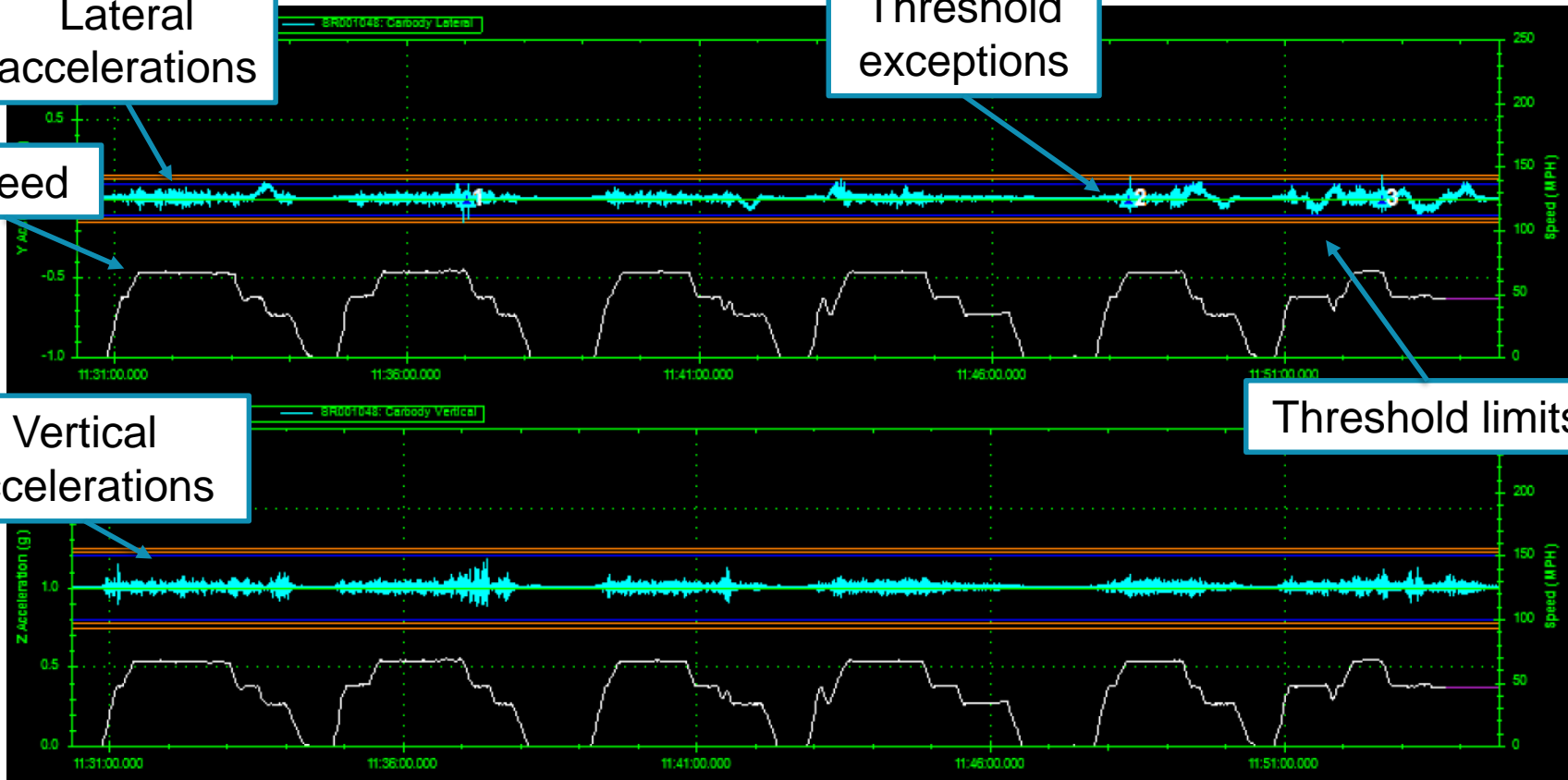
Lateral accelerations

Threshold exceptions

Speed

Vertical accelerations

Threshold limits





# BART Wheel / Rail Optimization

## *Wheel Monitoring - Dynamics*



# BART Wheel / Rail Optimization

## Wheel Monitoring - Cost



### Old Cylindrical

<b>TOTAL COST</b>	Total Cost	\$ 5,227,516	100%
\$	Cost / Inspection	\$ 250,875	5%
\$	Cost / Retruing	\$ 504,540	10%
\$	Cost / Refurbishment	\$ 2,718,250	52%
\$	Cost / Replacement	\$ 1,753,851	34%
#	Total Dwell Hours	26,229	

### Projected BT-3

<b>TOTAL COST</b>	Total Cost	\$ 3,367,698	100%
\$	Cost / Inspection	\$ 250,875	7%
\$	Cost / Retruing	\$ 285,195	8%
\$	Cost / Refurbishment	\$ 1,811,775	54%
\$	Cost / Replacement	\$ 1,019,853	30%
#	Total Dwell Hours	17,142	

**\$1.86M (55%), 9k Car Hour Dwell Reduction Annually**



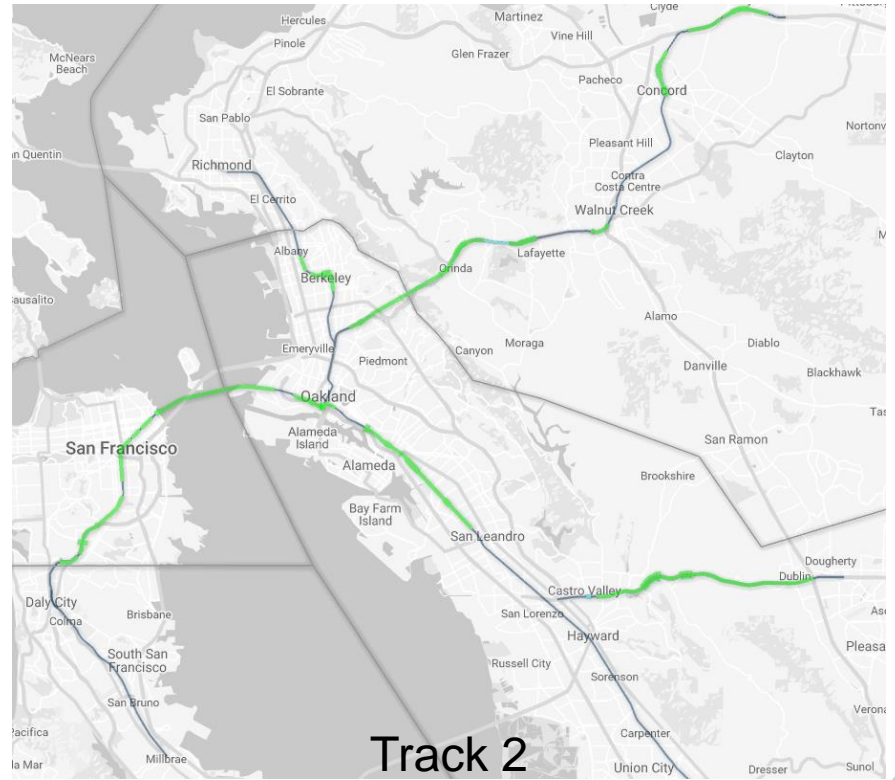
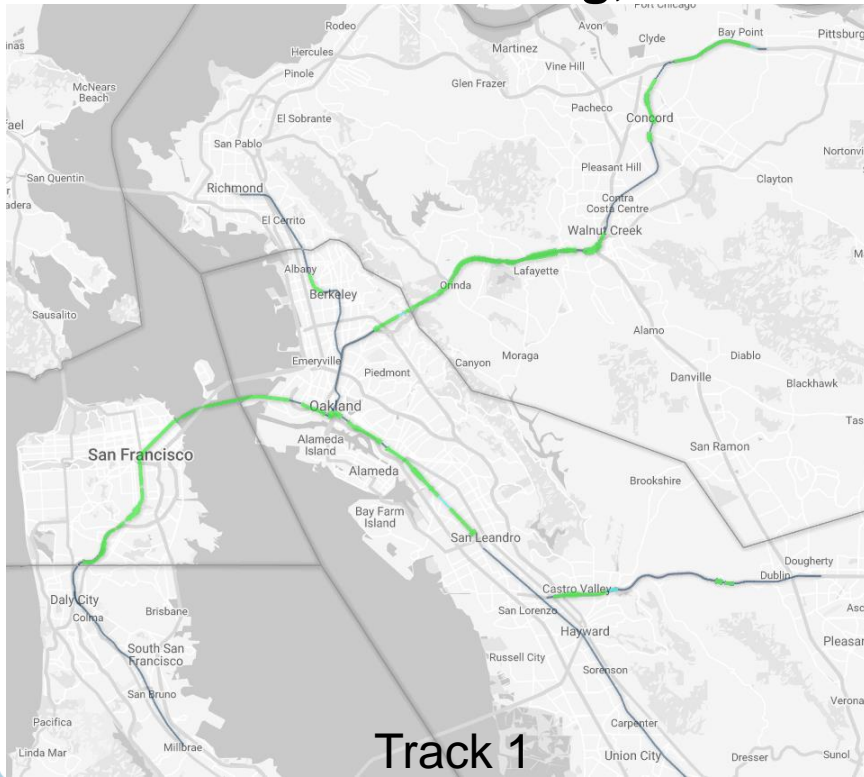
# BART Wheel / Rail Optimization

## Grinding Progress



81 miles ground to interim profile, 40%

130 miles remaining, 63%

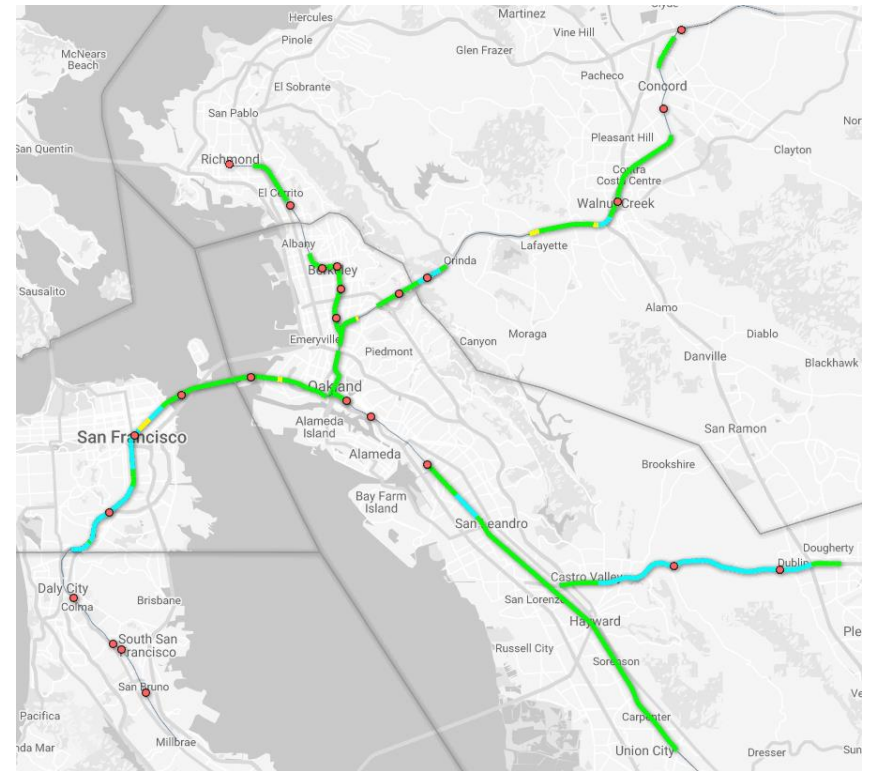


# BART Wheel / Rail Optimization

## *Rail Monitoring*



Track 1



Track 2

# BART Wheel / Rail Optimization

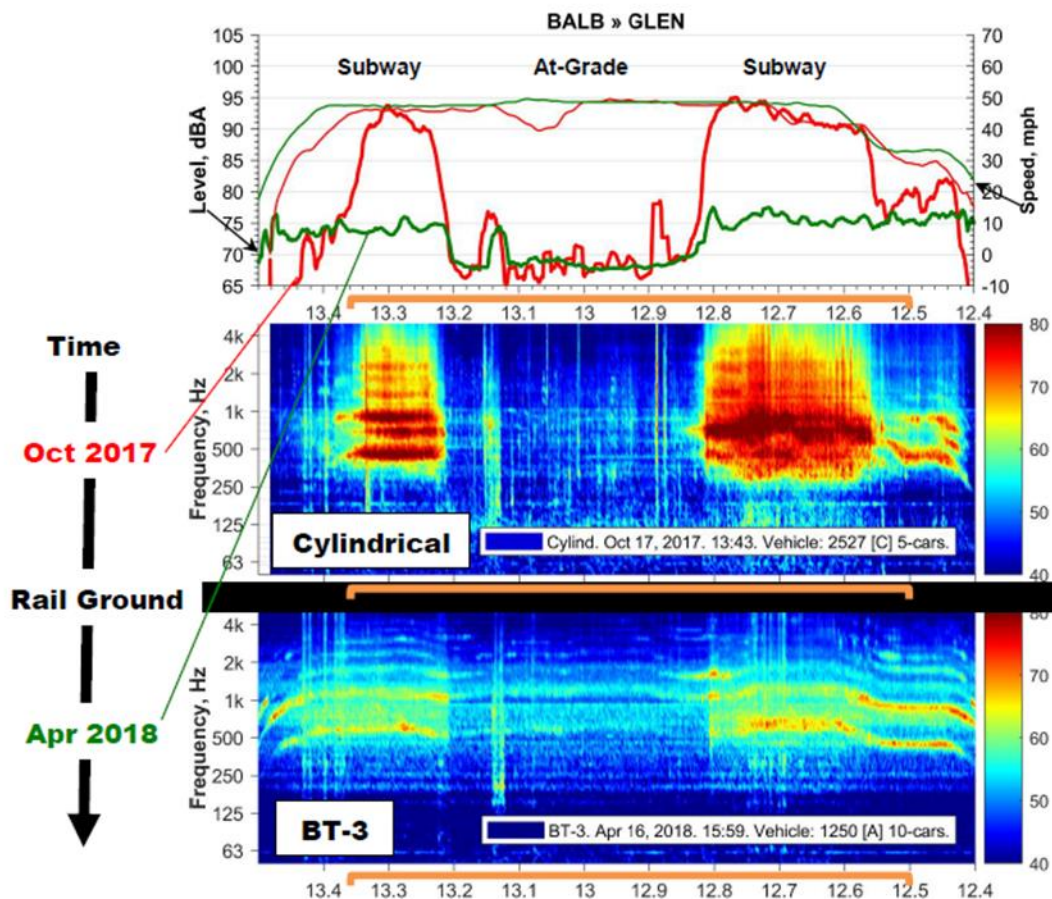
## Rail Monitoring



Rail Details and MT		2/9/2018	
Line:	L	Magnetic Particle Test Results	
Track:	L1		
Milepost:	15.7		
Rail:	West		
Curve:	TRUE		
Section:	119RE		
Rolled:	Mar-93		
Rolling Contact Fatigue	RCF: TRUE		
Max:	0		
Min:	0		
Avg:	0	Surface Condition	
Gauge:	NDA		
<b>AREMA 4.2 Condition</b>			
Corr:	TRUE		
λ:	0.00		
Amp:	0.00		
Gauge:	TRUE		
Width:	NDA		
Pos:	Undefined		
Spall:	FALSE		
Rough:	NDA		
Check:	FALSE		
Flake:	FALSE		
Spall:	LIGHT		
Shell:	FALSE		
<b>MiniProf or Manual</b>		MiniProf Measurement	
Area:	NDA		
Top Wear:	0.3020		
Side Wear:	0.0250		
GFA:	NDA		
Metal to Rem:	NDA		
Area ↑ Target:	NDA		
Area ↓ Target:	NDA		
Grind Quality:	NDA		
Top:	NDA		
Gauge:	NDA		
Field:	NDA		
Pre/Post Grind:	BASE		

# BART Wheel / Rail Optimization

## Noise Improvements

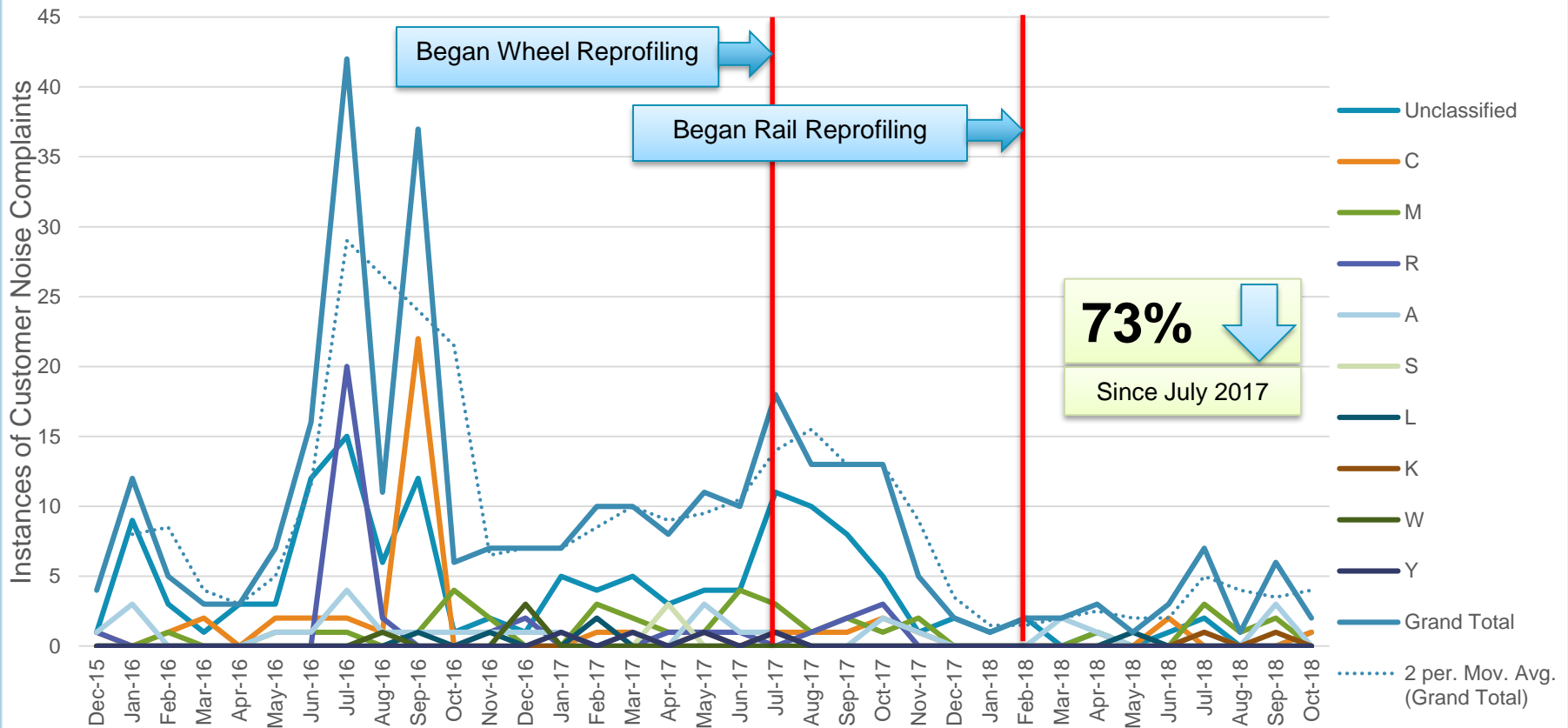




# BART Wheel / Rail Optimization Noise Improvements



Customer Noise Complaints by Line





# BART Wheel / Rail Optimization

## *Industry Interest & Participation*



- ❑ Presented at WRI, Wheel Rail Interaction Conference 2018
  - ❑ *200+ industry professionals discussing advances, technologies, and best practices in wheel / rail contact mechanics, dynamics, and vibration.*
- ❑ Participation in NYCT / FTA study on #7 Flushing Line wheel geometry
- ❑ Hosting London Underground Sr. Wheel / Rail Engineer for a demonstration of our efforts
- ❑ Interest from several other agencies including CTA, and MBTA in how to better their systems



# BART Wheel / Rail Optimization

## *Next Steps*



- ❑ **Continue with wheel and rail conversion and monitoring effort**
- ❑ **Grinder refurbishment**
- ❑ **Friction Modification study**
- ❑ **Wheel condemning limits / lifecycle analysis**
- ❑ **Advanced measurement technologies**
  - ❑ *Instrumented wheelsets – track performance measurements from railcar*
  - ❑ *Wayside detectors – railcar performance measurements from track*