

Light Rail Wheel/Rail Noise Mitigation Ashmont Station Noise Reduction

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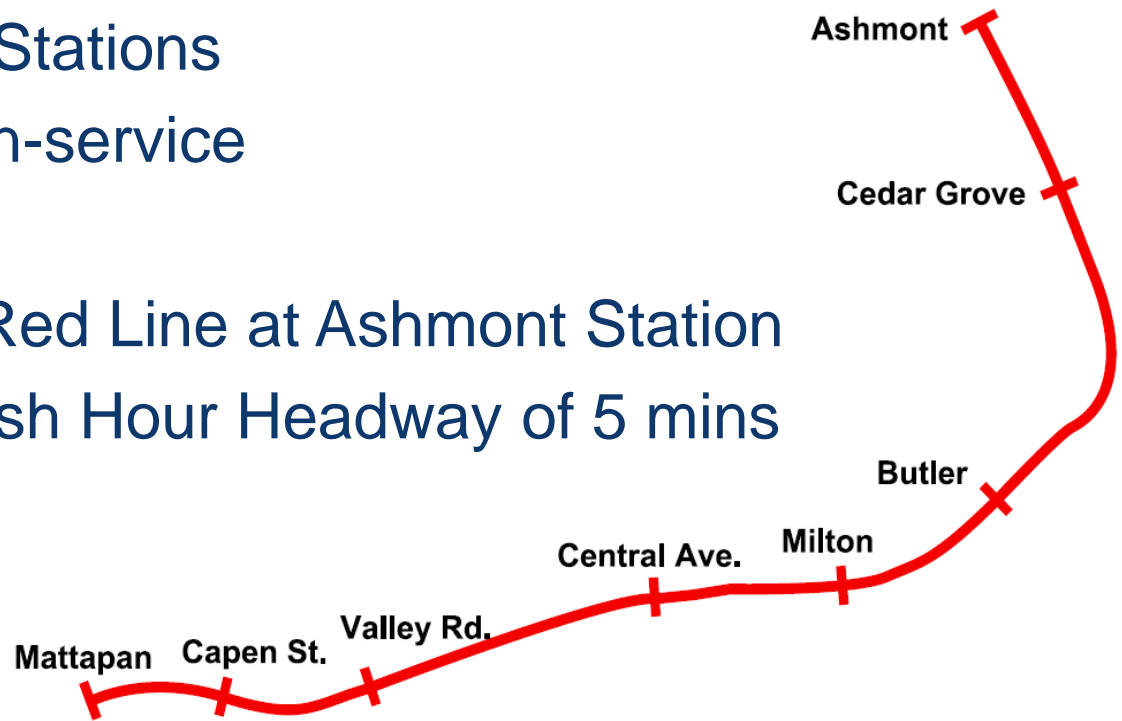
New England Regional Manager, LTK

June 14, 2011



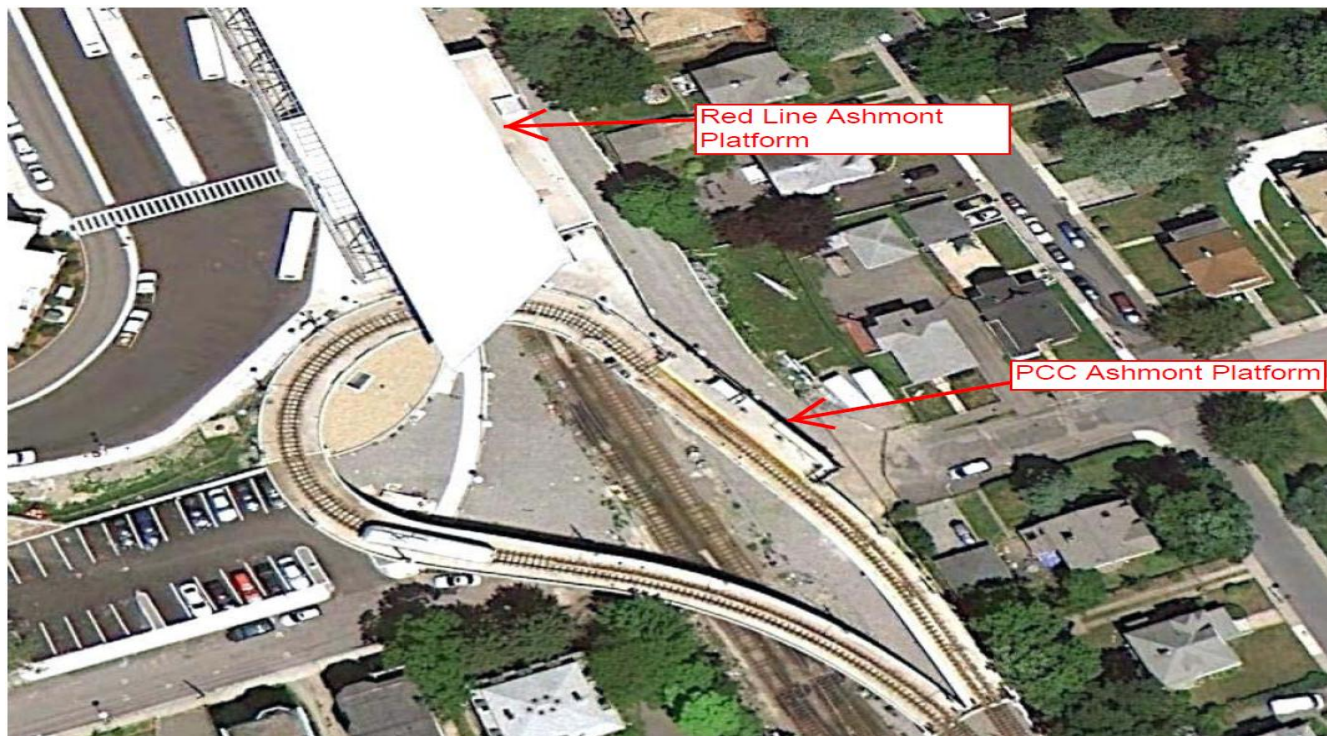
Ashmont-Mattapan High Speed Line Facts

- Operating since 1929
- 8 Passenger Stations
- 9 PCC Cars in-service
- 2.6 miles
- Connects to Red Line at Ashmont Station
- Operating Rush Hour Headway of 5 mins



Issue: Excessive Wheel Rail Noise

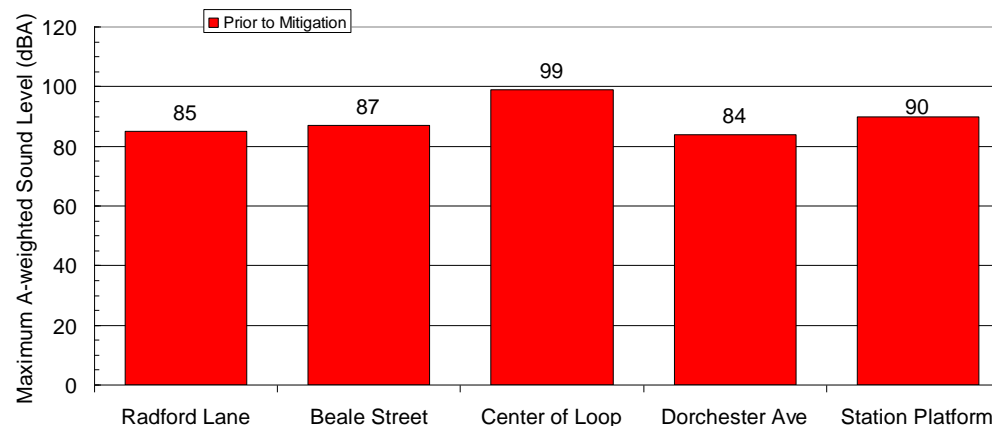
- New Ashmont MBTA Station required new turnaround
- Direct Fixation track approx. 65 ft radius
- Noise complaints from the surrounding community



MBTA Action

MBTA Subway Operations – vehicle maintenance department was tasked with developing a vehicle based solution for reducing wheel squeal of the PCC cars.

- Measurements were taken by HMMH in June 2010 at 5 locations which allowed the MBTA to analyze the sound and develop a “Wheel Squeal Spectra”.
- The MBTA immediately began investigating multiple short and long term corrective actions.



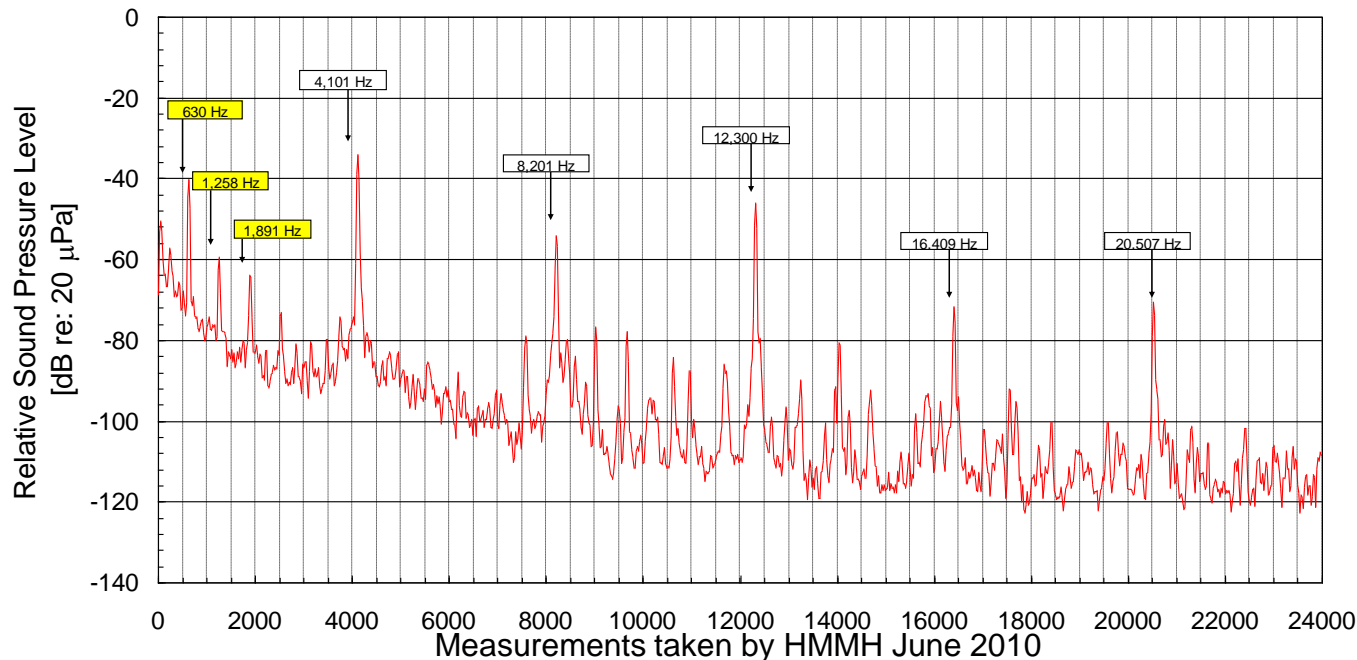
*Lmax - The highest noise level which occurs during approach to or departure from the station



Wheel Squeal Spectra

The analysis showed that the primary frequency source of the wheel squeal is 4,100 Hz. This analysis was used to develop corrective actions and was provided to potential solution providers.

Wheel "Squeal" Without Mitigation
at Center of Loop (65 feet), Car #3087



MBTA Solution Plan

■ Two Phases

■ Short Term

- Ashmont Loop Water Spray System
- Wheel Hubs
- Vehicle Based Spray System

■ Long Term

- Schrey & Veit (S&V) GMBH Wheel Absorbers

“A Vehicle Based Solution Benefits the Whole Line”

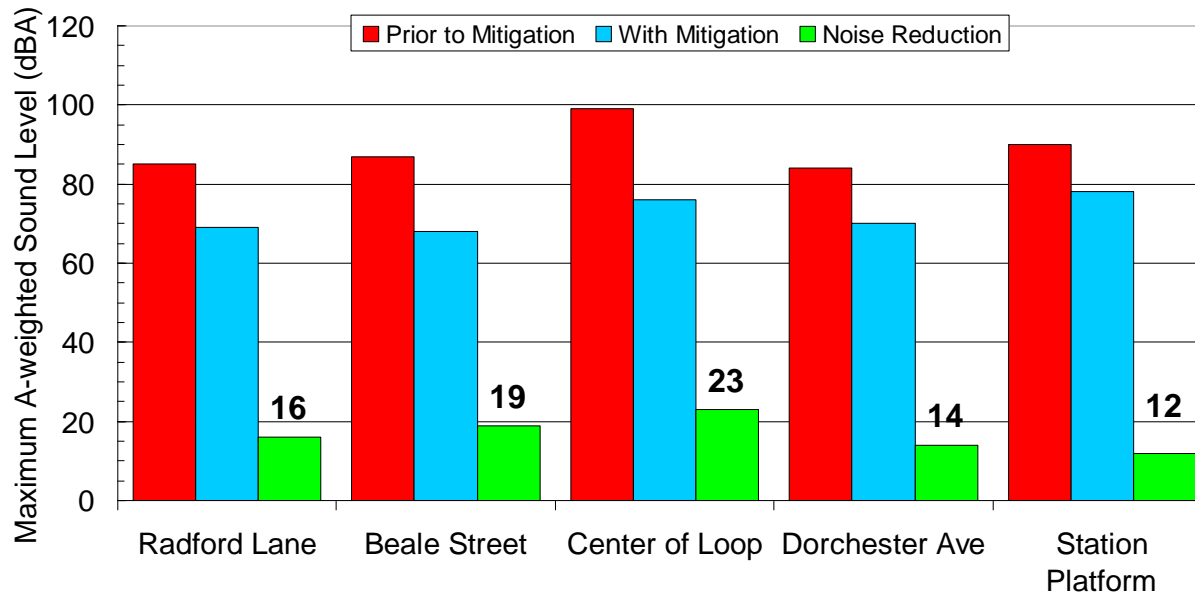


Short-Term Solutions



Ashmont Loop Water Spray System

- The spray system is located adjacent to rail
- A proven mitigation method
- Lubricates the rail as the train traverses the curve
- Impractical for the long term and in cold weather

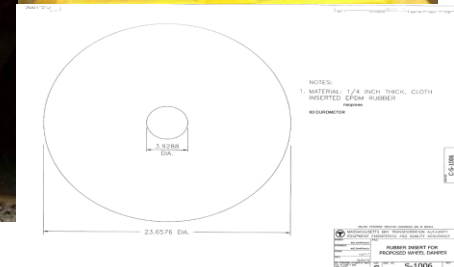
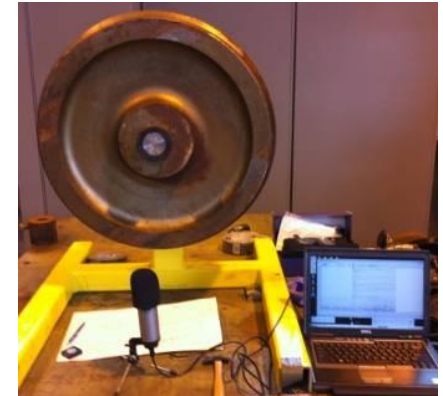


Measurements taken by HMMH June 2010



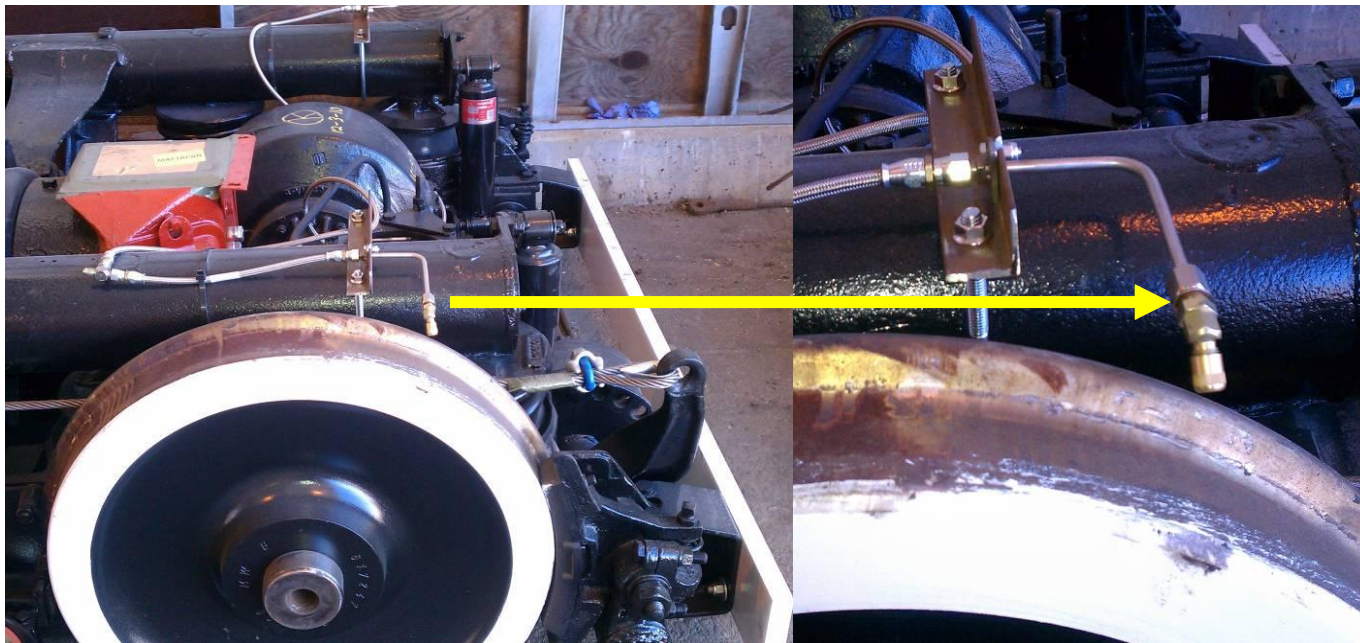
Rubber Hub

- Multiple configurations were evaluated, one selected
- The hub works to mitigate the sound radiating from the wheels
- Great short-term solution. Uncertainty remains about how long the rubber material will continue to be effective given constant service and environmental conditions.



Vehicle Spray System

- MBTA developed an onboard water spray system
- The system provides fluid directly onto the wheels of the lead truck
- The fluid changes the wheel to rail friction which reduces generated noise
- The flow of the water is initiated by the operator through a momentary switch

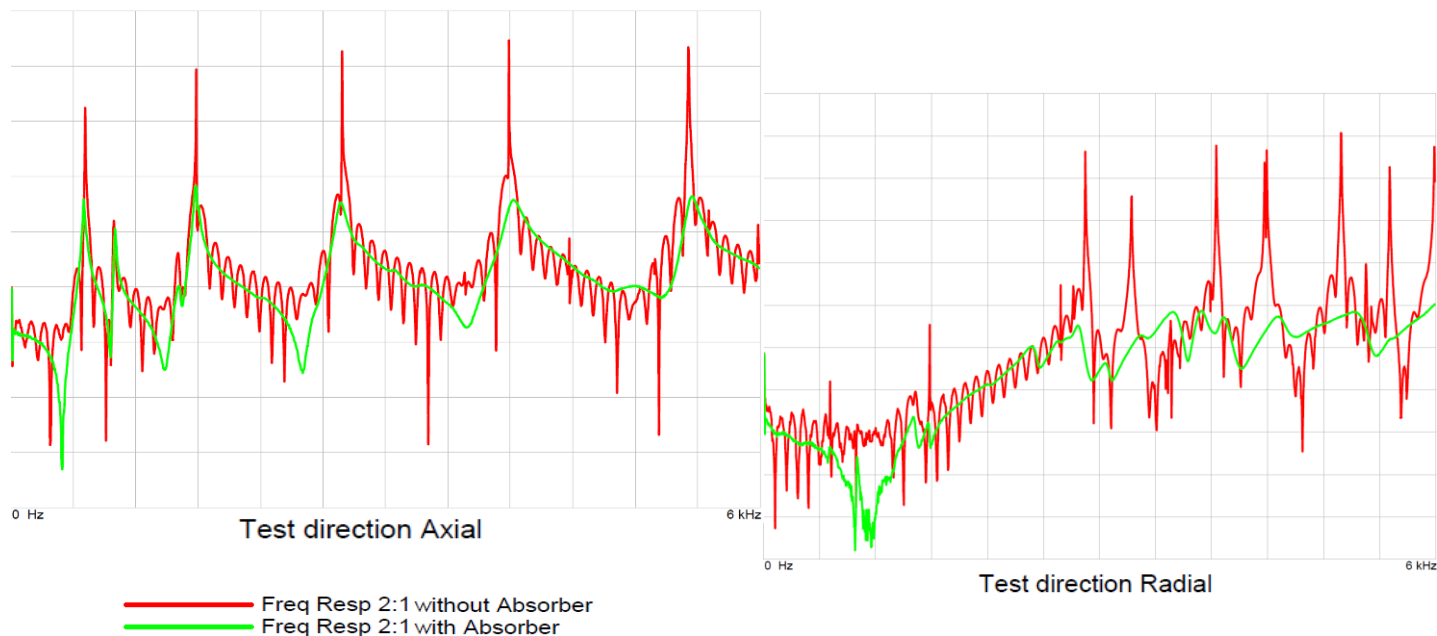


Long-Term Solutions

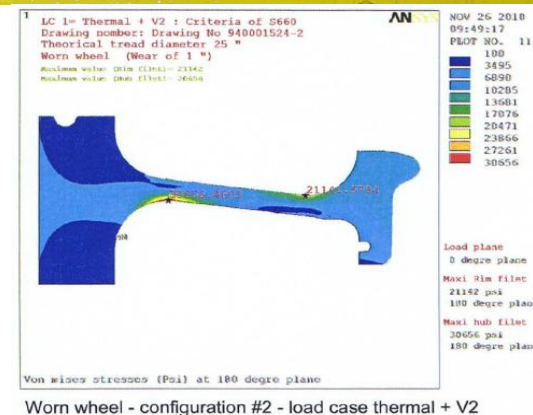
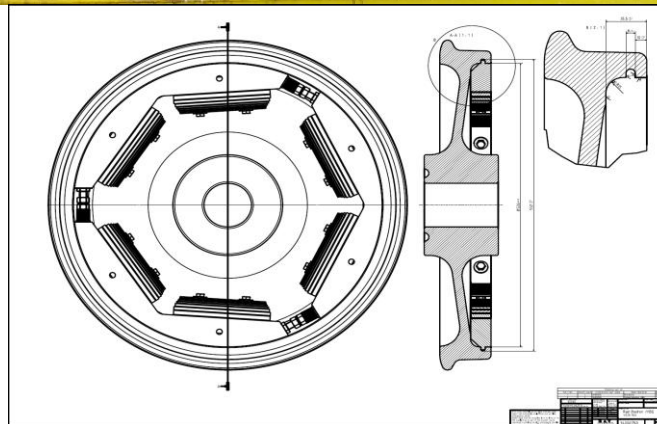


Tuned Vibration Absorber

- Schrey & Veit GMBH (S&V)
- Tuned vibration absorber affixed to the face of the wheel
- Laboratory testing showing frequency response correction



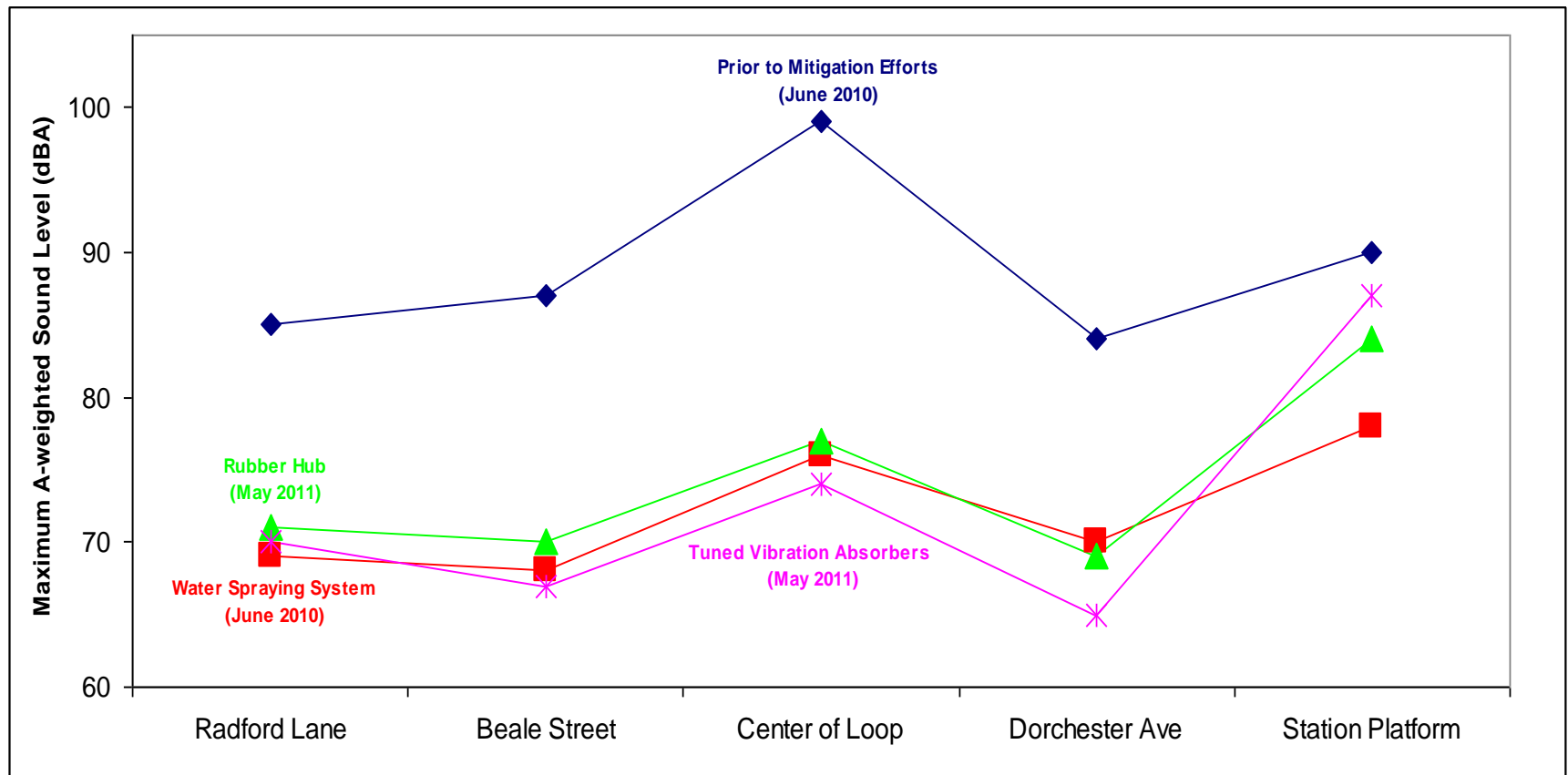
Schrey & Veit Tuned Vibration Absorber Design



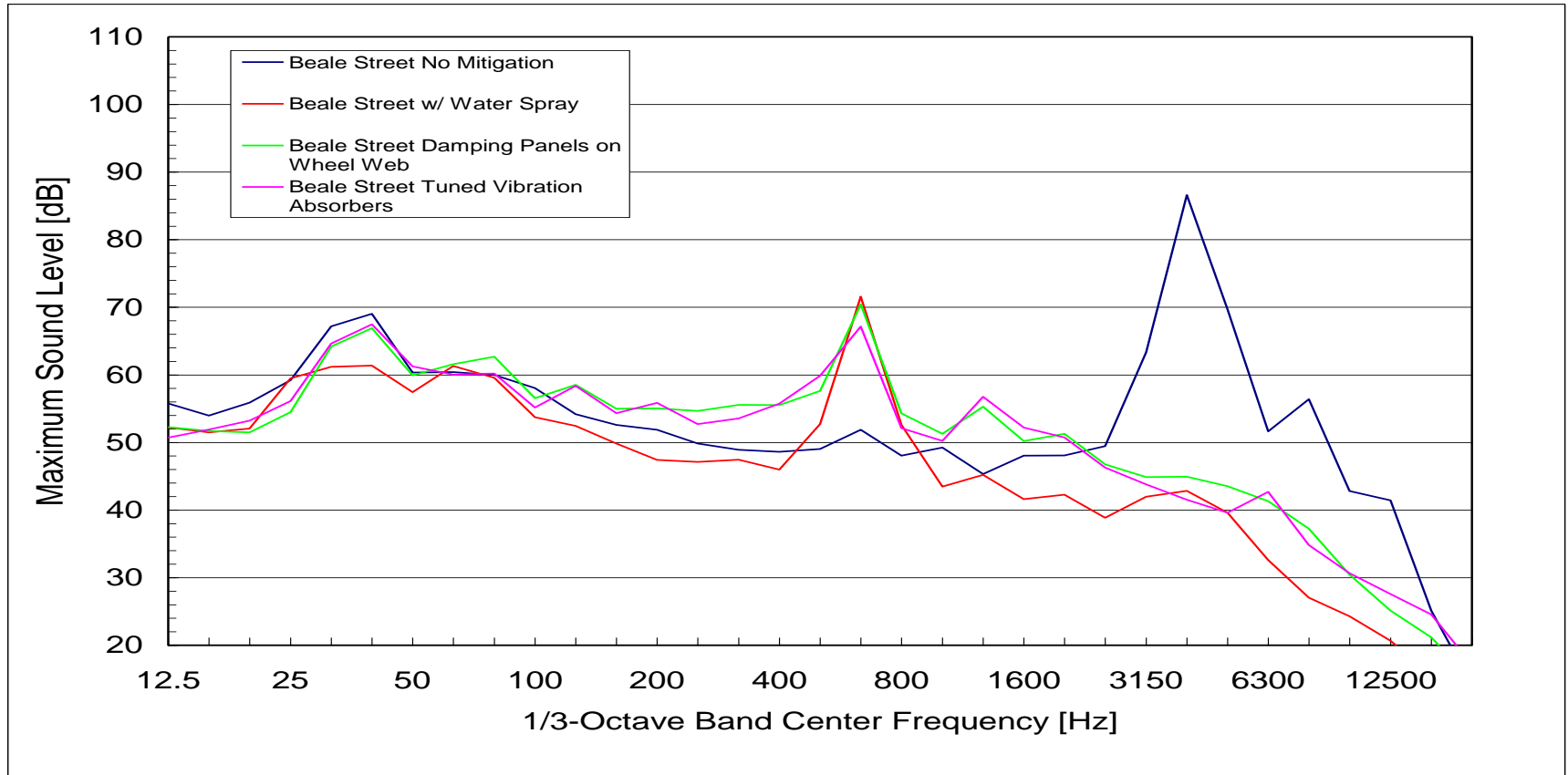
PCC Car Equipped With Tuned Vibration Absorber



Comparison of June 2010 & May 2011 Measurement Results

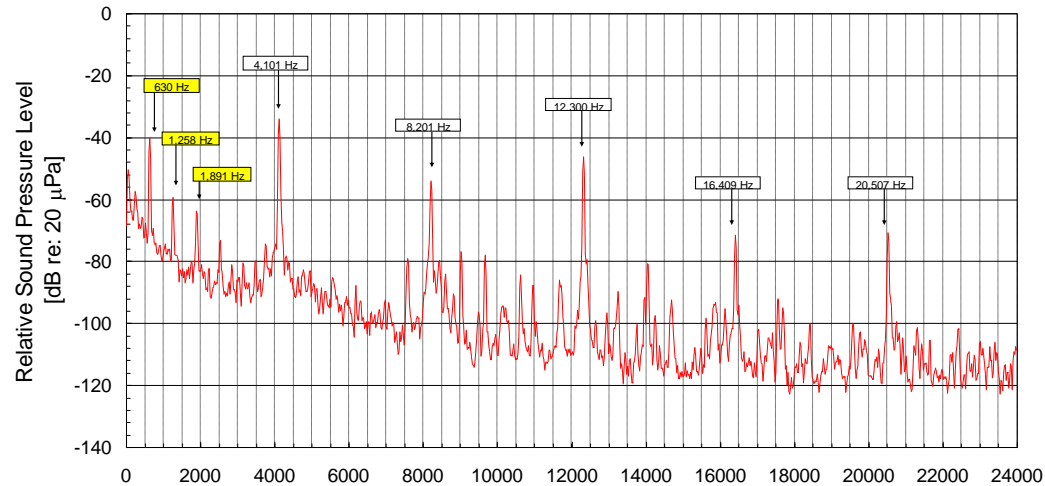


Wheel Squeal Spectra at Beale Street

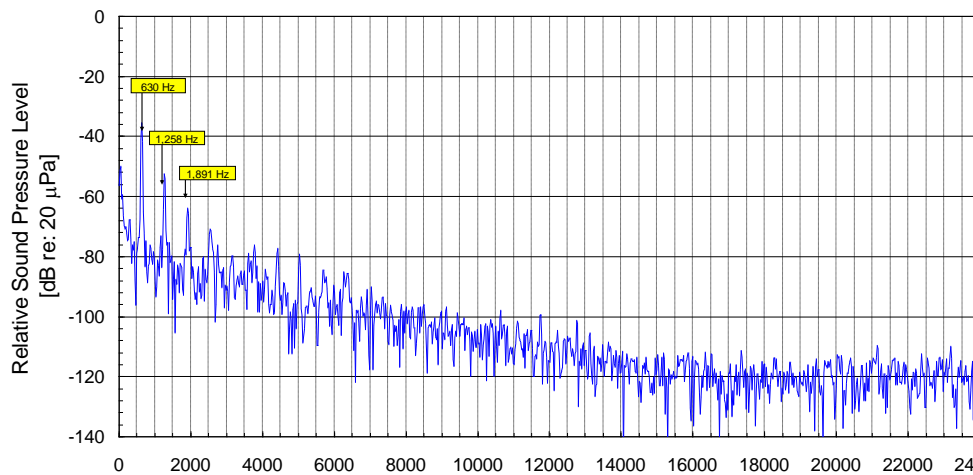


Comparisons of Corrective Actions

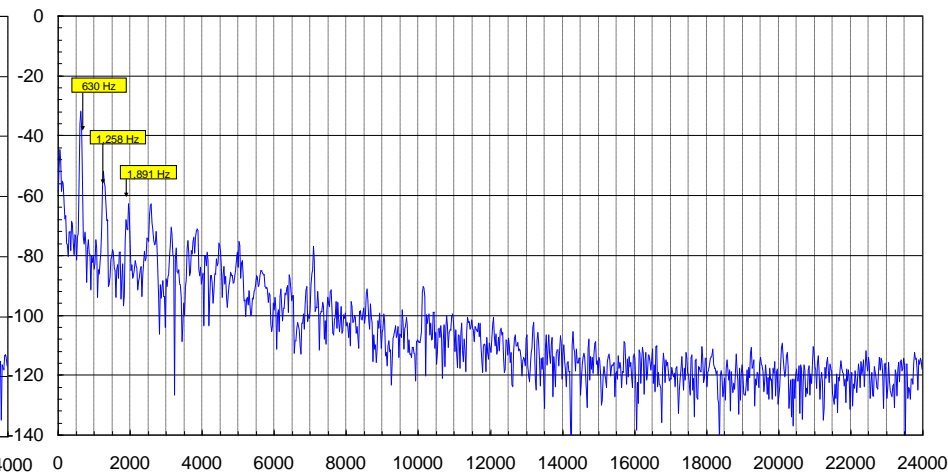
Wheel "Squeal" Without Mitigation
at Center of Loop (65 feet), Car #3087



Wheels with Rubber Damping Panels
at Center of Loop (65 feet), Car #3254



Wheels with Tuned Vibration Absorbers
at Center of Loop (65 feet), Car #3268



Long Term – Vehicle Based Noise Reduction

■ Final Configuration

- Schrey & Veit GMBH (S&V) Tuned Vibration Absorbers
- On board Water Spray System
- Back of Flange Lubrication



Acknowledgments



■ 3M



■ The Rubber Group



■ Schrey & Veit GMBH



■ HMMH



■ MBTA Everett Shops &
Mattapan Car House



Thank You

Go hear the results for yourselves - take the Red line to Ashmont!

