TESTIMONY OF JOHN MCPARTLAND, MEMBER
BOARD OF DIRECTORS

SAN FRANCISCO BAY AREA RAPID TRANSIT DISTRICT

BEFORE THE

U.S. HOUSE OF REPRESENTATIVES

COMMITTEE ON NATURAL RESOURCES SUBCOMMITTEE ENERGY AND MINERAL RESOURCES

OVERSIGHT HEARING ON "WHOLE LOTTA SHAKIN': AN EXAMINATION OF AMERICA'S EARTHQUAKE EVENT REACTION SYSTEM DEVELOPMENT AND IMPLEMENTATION "

JUNE 10, 2014

Thank you Chairman Lamborn, Ranking Member Holt, and members of the Subcommittee for inviting me to testify today at this very important hearing. On behalf of the San Francisco Bay Area Rapid Transit District (BART) I greatly appreciate the opportunity to submit a statement for the record to the Subcommittee on Energy and Mineral Resources oversight hearing on "Whole Lotta Shakin': An Examination of America's Earthquake Event Reaction System Development and Implementation."

The subcommittee is to be commended for holding this important hearing to address the critical role an early warning reaction system can play in the event of an earthquake.

My name is John McPartland and I am a Member of the BART Board of Directors. BART serves the San Francisco Bay Area, which, with over 8.4 million residents, is one of the largest metropolitan regions in the country. This densely and heavily populated area has helped make BART our country's fifth busiest heavy rail mass transit system, averaging over 400,000 passenger trips per weekday in the last quarter of 2013 and over 124 million for the year, according to the American Public Transportation Association.

During the peak of the commute period across the San Francisco Bay, BART carries as many travelers as the San Francisco-Oakland Bay Bridge. The BART system represents a public investment currently valued at nearly $15 billion, with immeasurable importance to the local and regional economy.

BART's success in maintaining continuous service directly after the 1989 Loma Prieta earthquake reconfirmed the system's importance as a transportation "lifeline." However, Loma Prieta may not be the biggest test of BART's ability to withstand seismic impact. A U.S. Geological Survey statistical analysis has predicted a high probability of one or more major earthquakes hitting the Bay Area within the next 30 years. Unlike Loma Prieta, which was centered more than 50 miles south of San Francisco; future earthquakes could be close to or directly under the BART system.

Because of the likelihood BART will be subject to a major earthquake, and to safeguard the public's significant investment in the system, BART has initiated an Earthquake Safety Program. The program will upgrade vulnerable portions of the original BART system to ensure safety for the public and BART employees. Portions of the original system with the highest traffic will be upgraded not only for human safety but also to ensure that it can return to operation shortly after a major earthquake. The upgrades will be accomplished by using the latest seismic standards to improve the structural integrity of BART facilities.

While the Earthquake Safety Program is key to ensuring the integrity of the system, an earthquake early warning system would enable BART to slow and possibly stop trains before quaking begins thereby reducing possible derailments, and potential passenger injuries.

As of August 2012, BART has implemented an Earthquake Event Reaction System. The BART Earthquake Event Reaction System receives data from the more than 160 seismic stations of the California Integrated Seismic Network throughout Northern California. If the messages from the seismic network indicate ground motion above a certain threshold, the BART central computers, which supervise train performance, institute a normal service braking to slow trains down to 26 miles per hour. An automatic system-wide “hold” is put in place such that no train will depart a station without manual intervention. With the automated braking in place, BART Train Controllers, reacting to the same alert, instruct Train Operators to maintain 26 miles per hour or brake to a stop depending on the specific operational situation for each train.

The system is based on the principle that network communication travels much faster than the shaking due to an earthquake. Shaking detected at a seismic station near an earthquake epicenter can trigger an alarm soon after the earthquake happens. This alarm can be communicated almost instantly to other locations (including BART), whereas the earthquake shaking travels relatively slowly at a little over 2 miles per second. Notification of an earthquake detected 120 miles

away can be received around 1 minute before the actual shaking arrives. The farther the earthquake from the Bay Area, the more time trains have to slow from speeds up to 70 mph.

The system software is running on a pair of redundant servers in BART's central computer room, connected over the internet to a pair of redundant servers at the University of California, Berkeley Datacenter in Berkeley. Automated response to the UC Berkeley system has been in operation since 8/5/2012.

The BART servers:

- Process raw data (one sample per second on each of three axes) from approximately 160 seismic stations located throughout Northern California.
- Apply an algorithm to filter out false positives due to maintenance activity or other anomalous behavior.
- Correlate events from multiple seismic stations, declaring an earthquake event when data from three independent stations indicate shaking above a threshold value.
- Communicate earthquake events to BART's Train Control computer as they happen.

The BART Train Control computer performs the same action on receipt of an alarm from any of the thirteen seismic sensors, owned and maintained by BART, located in BART Train Control Rooms.

BART believes this notification system represents the best available technology but would welcome additional federal investment in and attention to the development of next generation technology that would provide more robust and advance notification. We are grateful for the Subcommittee's interest in this critical infrastructure and safety issue.