We're planning for quieter rail and safer crossings.

metro.net/soundwalls

STRATEGIES FOR REDUCING TRANSIT NOISE AND VIBRATION

Fact Sheet

Overview

We're creating quieter communities with strategies to reduce noise and vibration. Metro is continuously working to improve the quality of life for LA County residents living near existing and planned transit lines.

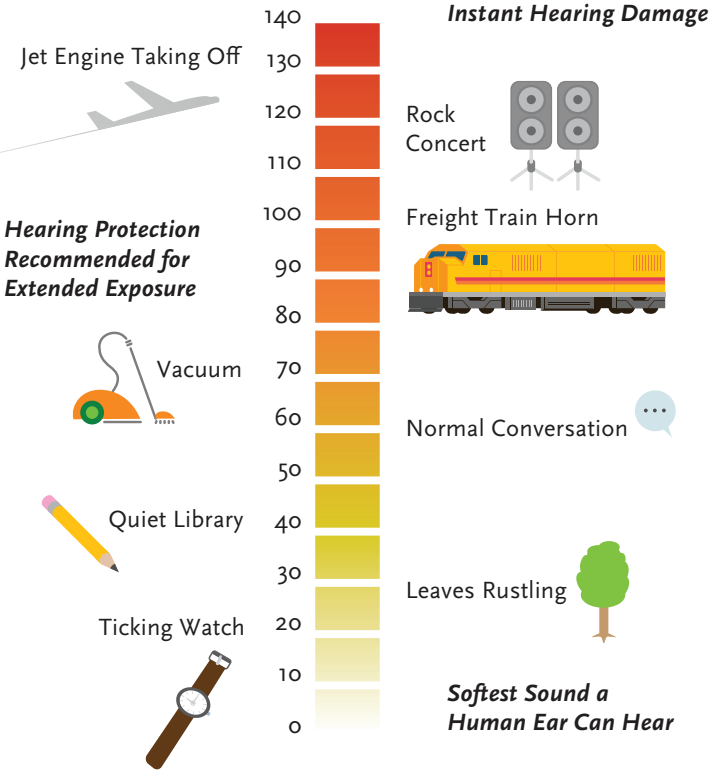
Metro is planning a light rail extension in the South Bay along segments of the Harbor Subdivision, an existing freight corridor that Metro owns. Currently, BNSF operates freight trains, which move cargo along the corridor and run infrequently around once or twice a day. Freight trains are large, heavy vehicles that cause a lot of vibration in the ground. They are also required to sound their horns when they approach a street crossing.

Metro is proposing to add a light rail line to the existing freight corridor, which when it opens will most likely operate from early morning (5am) to late evening (12am) and come every five to 15 minutes. Light rail trains are not as loud as freight trains and don't cause as much vibration because they not as heavy. However, they will cause some noise and vibration.

The California Environmental Quality Act (CEQA) is a state law that requires Metro to analyze noise and vibration as a potential environmental impact to the community. Metro measures existing noise and vibration levels in the project area with measuring equipment, then compares it to potential future noise and vibration levels generated by rail using a computer program or model. Let's break down some of these terms in better detail.

What is noise?

Noise is generally defined as unwanted sound. Common sources of noise include traffic, airplane, landscaping equipment, loud music and construction equipment. The standard unit of measurement for sound is the decibel (dB). The A-weighted scale (dBA) reflects the normal hearing range of humans. Common sources of noise and their average dBA are described below:



Metro

What is vibration?

Ground-borne vibration is similar to sound but travels through a solid material, such as soil or concrete. High levels of vibration may cause damage to some structures, such as plaster cracking in walls. Some levels of vibration can cause annoyance or sleep disruption to the the occupants of structures near the vibration source, especially if it occurs frequently. Common sources of vibration include heavy trucks, freight trains, rail vehicles and some types of construction equipment.

What types of noise and vibration are caused by light rail and freight trains?

Light rail: generates noise and vibration from the wheels moving on steel tracks as the train passes, as well as warning bells at street crossings.

Freight trains: generate higher levels of noise and vibration than light rail, as they are much larger and powered by heavier diesel engines rather than overhead power lines. Freight trains are required to blow their horn to a volume level of 96-110 decibels within a quarter-mile of street crossings. The horns generate a noise level around 110 dBA at 50 feet.

The levels of noise and vibration for light rail and freight trains depend on several factors, including:

> Existing conditions – Terrain, as well as natural and manmade obstacles, such as walls, berms, hillsides and soil types, can affect the way noise and vibration are blocked, reflected or absorbed.

> Track type and conditions – The track structure, height and maintenance can affect noise and vibration.

> Rail Frequency – how often trains pass within a time period.

> Rail speeds – higher speeds tend to generate higher noise and vibration.

> Distance – how close the trains are to nearby sensitive uses.

How does Metro measure noise and vibration?

Metro follows the Federal Transit Administration's (FTA) Noise and Vibration Impact Assessment Manual, which provides criteria to assess potential impacts from transit projects based on real world data.

The process involves several steps, such as:

> Identify sensitive uses or locations in the project area (homes, churches, schools)

> Measure existing levels of noise and vibration in the community before the project

> Use the expected train noise and vibration to estimate potential new sound levels

> Develop strategies to effectively reduce noise and vibration to acceptable levels at sensitive locations

What type of solutions are available to reduce noise and vibration?

Under California environmental law (CEQA), these solutions are called mitigation measures because they mitigate or reduce the level the problem. Below are types of solutions used in reducing noise and vibration followed by a short explanation of what they are.

> Soundwalls

> Quiet zones

> Crossing signal bell shrouds

> Gate-down bell stop variances at rail street crossings

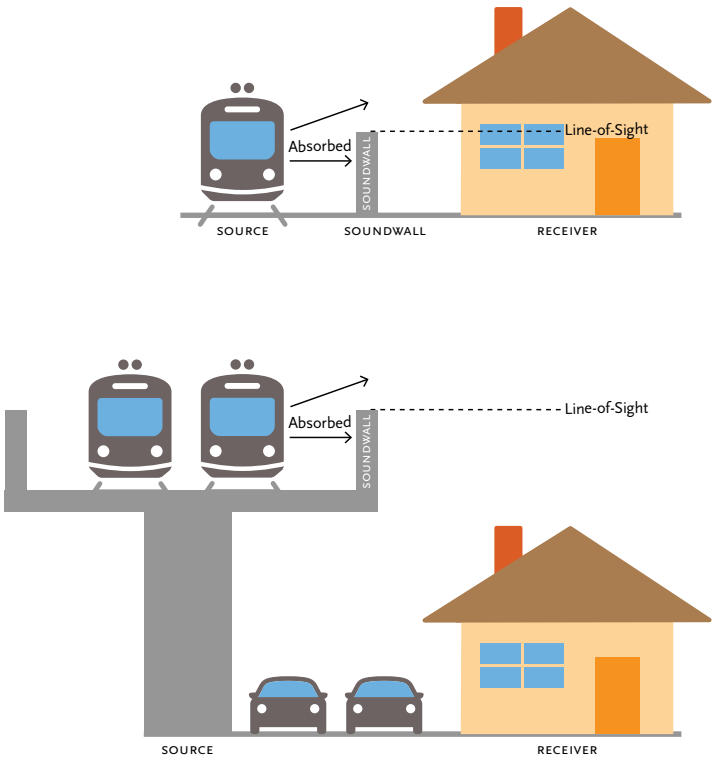
> Wheel squeal noise monitoring and rail lubrication

> Special track work, such as low-impact frogs at crossovers, ballast mats and resilient rail fasteners

Example of a light rail train (Metro E Line) traveling alongside soundwalls through a neighborhood.

What are soundwalls?

Soundwalls are noise barriers built between a source (train) and a sensitive receptor (home, school, church) to absorb or reflect sound waves and reduce the overall level of noise. They are typically located on the edge of the rail track to cover the train wheels. A general rule, shown in the graphic below, is: "if you can see it, you can hear it." The height of soundwalls varies. Soundwalls adjacent to elevated rail are typically lower than soundwalls along at-grade light rail segments, as the line-of-sight is more easily blocked when the light rail trains are above the sensitive receptors.



The design and location of the soundwalls for the project are dependent on the height of the rail tracks, existing conditions, including topography (slopes, berms), and the proximity to sensitive uses. The benefit of a soundwall decreases as the listener moves away from the soundwall. Soundwall benefits typically become insignificant at distances greater than 350 feet from a soundwall, although noise impacts usually are not present this far away from the noise source.

Soundwalls located near street crossings must not obstruct the train operator's line of sight within a certain distance from a crossing. To provide clear line of sight, the soundwall may be lowered near a crossing.

What are quiet zones?

A quiet zone is a section of a rail corridor at least one-half mile in length where trains are not required to use horns at crossings with federally required and approved safety measures. Quiet zones would include site-specific safety infrastructure, such as vehicle gates and pedestrian gates, signals, such as lights and bells, and sidewalks and ramps that are all compliant with the American Disability Act. Local jurisdictions can implement quiet zones in coordination with the CPUC, Metro and the Federal Railroad Administration.

Quiet zones corridors include enhanced safety gates at rail crossings so that trains can pass by without sounding their horn. Source: Metrolink

What are crossing bell shrouds?

Bell shrouds at crossings partially enclose the bells at street crossings to help direct the bell noise toward the roadway and away from sensitive uses nearby.

What is a Gate-Down-Bell-Stop variance?

A Gate-Down-Bell-Stop variance would allow all the light rail bells to stop ringing once the crossing gates have completely lowered at street crossings. This reduces the duration of signal ringing and the overall noise generated by the bells. For example, a typical ringing duration without the variance may be one minute, while a crossing with the variance would have a ring duration of approximately 10 seconds.

What is wheel squeal and what are rail lubricators?

Wheel squeal, a high-pitched screeching sound, may occur on tight curves where increased friction between the wheels and track produces a squeal. Wheel squeal can be reduced by the use of rail lubricators at curves where the squeal has been identified. The rail lubricators lessen friction on the curve and thereby the squeal.

Rail lubricator. Source: Loram

Special Trackwork

> **Low impact frogs** are crossovers (where two rail tracks meet) with a loaded spring mechanism or moveable mechanism, which closes the gap between rails and reduces the chance for the "clickety-clack" noise to occur, as well as vibration.

Source: voestalpine AG

> **Resilient fasteners** are small rubber pads inserted between the steel rails and the track ties, which are used to reduce vibration.

Source: voestalpine AG

> **Ballast mats** are wide rubber mats that are inserted between the track system and the compacted ground underneath, which reduce vibrations.

Source: Buildtec

Metro is looking at all of the solutions above to reduce ongoing noise and vibration levels in the community after the project opens.

Construction Noise and Vibration

Metro's transportation projects also produce noise and vibration during the time it takes to build the project. These construction impacts will be temporary and will only last during certain portions of construction work, such as digging activities that use heavy equipment and trucks to haul dirt away from the project site, or equipment to stabilize walls and pillars, such as pile drivers or other heavy machinery. These types of activities and the use of heavy equipment will cause extra noise and vibration in the community and will require solutions to reduce their levels. The environmental document (Draft EIR) will also evaluate noise and vibration predicted to happen during construction, and identify mitigations to reduce impacts, where feasible.

Example of soundwalls adjacent to residential properties along Metro L Line.

For more information, visit *metro.net/soundwalls.*