



### How Traffic Volume Affects Noise




2000 vehicles per hour sound twice as loud as




200 vehicles per hour

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### How Speed Affects Traffic Noise




Traffic at 65 miles per hour sounds twice as loud as




Traffic at 30 miles per hour

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### How Trucks Affect Traffic Noise



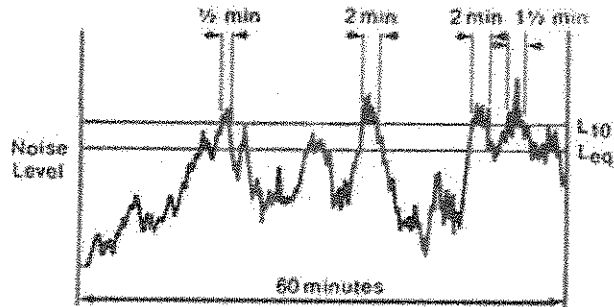
One truck at 55 miles per hour sounds as loud as



10 cars at 55 miles per hour

## Determining Noise Impact

Highway traffic noise is never constant. The noise level is always changing with the number, type, and speed of the vehicles which produce the noise. Traffic noise variations can be plotted on a graph as shown below. However, it is usually inconvenient and cumbersome to represent traffic noise in this manner. A more practical method is to convert the noise data to a single representative number. Statistical descriptors are almost always used as a single number to describe varying traffic noise levels. The two most common statistical descriptors used for traffic noise are  $L_{10}$  and  $L_{eq}$ .  $L_{10}$  is the sound level that is exceeded 10 percent of the time.



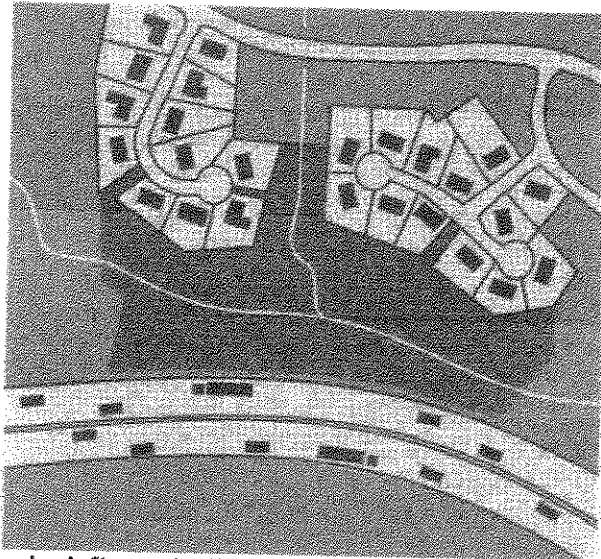
In the above graph, the shaded areas represent the amount of time that the  $L_{10}$  value is exceeded. Adding each interval during which this occurred shows that during the 60-minute measuring period the  $L_{10}$  was exceeded 6 minutes ( $1/2 + 2 + 2 + 1 1/2 = 6$ ) or 10 percent of the time. The calculation of  $L_{eq}$  is more complex.  $L_{eq}$  is the constant, average sound level, which over a period of time contains the same amount of sound energy as the varying levels of the traffic noise.  $L_{eq}$  for typical traffic conditions is usually about 3 dBA less than the  $L_{10}$  for the same conditions. The Federal Highway Administration (FHWA) has established noise impact criteria for different land uses close to highways. Some of the exterior criteria are illustrated below.

Land Use	$L_{10}$	$L_{eq}$
Residential	70 dBA	67 dBA
Commercial	75 dBA	72 dBA

If a project causes a significant increase in the future noise level over the existing noise level, it is also considered to have an impact.

## Noise Reduction on Existing Roads

Some noise reduction measures that are possible on existing roads or on roads that are being rebuilt include creating buffer zones, constructing barriers, planting vegetation, installing noise insulation in buildings, and managing traffic. Buffer zones are undeveloped open spaces which border a highway. Buffer zones are created when a highway agency purchases land or development rights, in addition to the normal right of way, so that future dwellings cannot be constructed close to the highway. This precludes the possibility of constructing dwellings that would otherwise experience an excessive noise level from nearby highway traffic. An additional benefit of buffer zones is that they often improve the roadside appearance. However, because of the tremendous amount of land that must be purchased and because in many cases dwellings already border existing roads, creating buffer zones is often not possible.

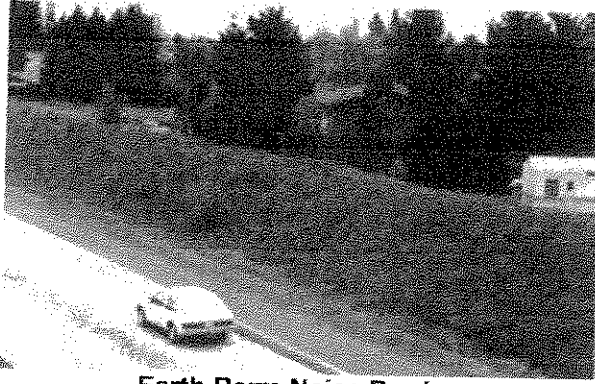


**Open space can be left as a buffer zone between residences and a highway.**

Noise barriers are solid obstructions built between the highway and the homes along the highway. Effective noise barriers can reduce noise levels by 10 to 15 decibels, cutting the loudness of traffic noise in half. Barriers can be formed from earth mounds along the road (usually called earth berms) or from high, vertical walls. Earth berms have a natural appearance and are usually attractive. However, an earth berm can require quite a lot of land if it is very high. Walls take less space. They are usually limited to 25 feet in height for structural and aesthetic reasons. Noise walls can be built of wood, stucco, concrete, masonry, metal, and other materials. Many attempts are being made to construct noise barriers that are visually pleasing and that blend in with their surroundings.

However, barriers do have limitations. For a noise barrier to work, it must be high enough and long enough to block the view of a road. Noise barriers do very little good for homes on a hillside overlooking a road or for buildings which rise above the barrier. Openings in noise walls for driveway connections or intersecting streets destroy the effectiveness of barriers. In some areas, homes are scattered too far apart to permit noise barriers to be built at a reasonable cost.

## Types of Roadside Barriers



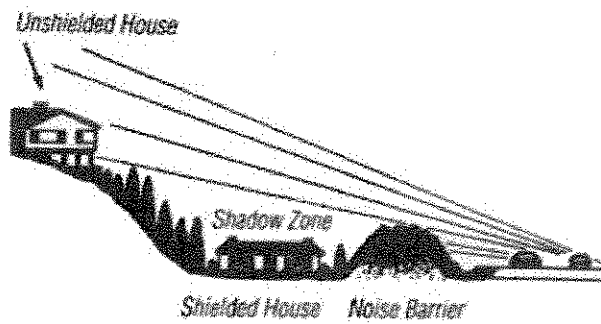
**Earth Berm Noise Barrier**



**Wooden Noise Barrier**



**Concrete Noise Barrier with Wood grain Texture**



### **Shadow Effect of Noise Barrier**

The lower house is protected by the barrier, but the upper one is not.

## Trees and Vegetation Impact on Noise

*Vegetation*, if high enough, wide enough, and dense enough (cannot be seen through), can decrease highway traffic noise. A 200-foot width of dense vegetation can reduce noise by 10 decibels, which cuts the loudness of traffic noise in half. It is often impractical to plant enough vegetation along a road to achieve such reductions; however, if dense vegetation already exists, it could be saved. If it does not exist, roadside vegetation can be planted to create psychological relief, if not an actual lessening of traffic noise levels.

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200 feet



Loudness Cut in Half



No Noise Reduction (Psychological)