A number of factors affect sound as it is perceived by the human ear. These include the actual level of sound (or unwanted sound, called "noise"), the frequencies involved, the period of exposure to the noise, and the changes or fluctuations in the noise levels during exposure. Levels of noise are measured in units called decibels (dB). Because the human ear cannot perceive all pitches or frequencies equally well, measured sound levels are adjusted or weighted to correspond to human hearing. This adjusted unit is known as the "A-weighted" decibel. All references to noise in this report refer to A-weighted decibel levels, abbreviated as dBA.

Very few noises are constant. Most fluctuate in decibel level over short periods of time. One way of describing time-varying sound is to describe the fluctuating noise heard over a specific time period as if it had been a steady, unchanging sound. For this, a descriptor called the Equivalent Sound Level, L_{eq}, is computed. L_{eq} is the constant sound level (A-weighted) that, for a given situation and period (e.g., 1-hour L_{eq}, or 24-hour L_{eq}), conveys the same sound energy as the actual time-varying sound. The 1-hour L_{eq} during the peak-traffic-noise-hour period is often used to determine necessary abatement measures for roadway noise, while 24-hour cumulative L_{eq} averaging methods are used to evaluate typical noise exposure in an area.

Roadway noise is dependent on many factors: vehicle type and speed, number of vehicles, roadway surface and gradient, distance from the roadway to the receiver, relative location of a receptor to noise source, ground surface characteristics (whether acoustically reflective or absorptive, "pavement" or "vegetation"), meteorological factors such as wind and temperature gradients and shielding due to structures, soundwalls, hills, the edge of a roadway, and earthen berms between a receiver and the traffic. Generally, if vehicle speed and/or traffic volume increases, so does the noise level. However, heavy trucks typically operate at a more constant noise output than automobiles regardless of speed, because they retain a nearly constant engine rpm level at varying speeds.

Another difference between automobiles and trucks is the location of their noise sources. The noisiest components on most trucks are the exhaust stack and engine, while tires typically generate the greatest noise levels from cars. This affects the noise reduction provided by a barrier because both the height and proximity of the source and receiver with respect to the barrier's location and height are important in determining the effectiveness of the barrier. The shape and surface of the barrier will also affect the attenuation provided by the barrier. For example, an absorptive earthen berm or a hill may provide up to 3 dBA greater attenuation compared to a screen-wall barrier of the same height.

Roadway surface and gradient also affect the resultant noise. Surfaces vary from rough and potholed to smooth and seal-coated, and this can lead to about 3- to 4-dBA difference in generated noise level among different types of surfaces (Source: Fundamentals and Abatement of Traffic Noise, Bolt, Beranek and Newman). The roadway gradient primarily only influences noise levels for heavy truck traffic; the greatest effect is from an uphill grade, which increases noise levels.

Trucks traveling up a gradient must apply substantially more power to maintain speed; because noise levels for trucks are strongly linked with power output, the noise levels increase commensurately.

Potential responses of persons to changes in the noise environment are usually assessed by evaluating differences between the existing and total predicted future noise environments. The following relationships of perception and response to quantifiable increases are used as a basis for assessing potential effects of traffic noise:

- Except in a carefully controlled laboratory condition, a change of 1 dBA is very difficult to perceive.
- In the outside environment, a 3 dBA change is considered perceptible.
- An increase of 5 dBA is considered readily perceptible and would generally result in a change in community response.
- A 10 dBA increase is perceived as a doubling in loudness and would likely result in a widespread community response.