

## Traffic Noise Overview<sup>1</sup>

### Noise Fundamentals

*What is Noise?*

- **SOUND** – A VIBRATORY DISTURBANCE CAPABLE OF BEING DETECTED BY THE EAR
- **NOISE** – UNWANTED SOUND THAT MAY INTERFERE WITH NORMAL ACTIVITIES

*Where does Traffic Noise Originate?*

Low Travel Speeds	<ul style="list-style-type: none"> <li>➤ Engine</li> <li>➤ Gear Box and Transmission</li> <li>➤ Exhaust</li> </ul>
High Travel Speeds	<ul style="list-style-type: none"> <li>➤ Tire/Road Noise</li> <li>➤ Aerodynamics of vehicle</li> </ul>

Traffic noise is measured on a logarithmic scale, using A-weighted decibels (dB(A)), and an hourly equivalent sound level ( $L_{eq}$ ).

*Perception of Noise Changes*

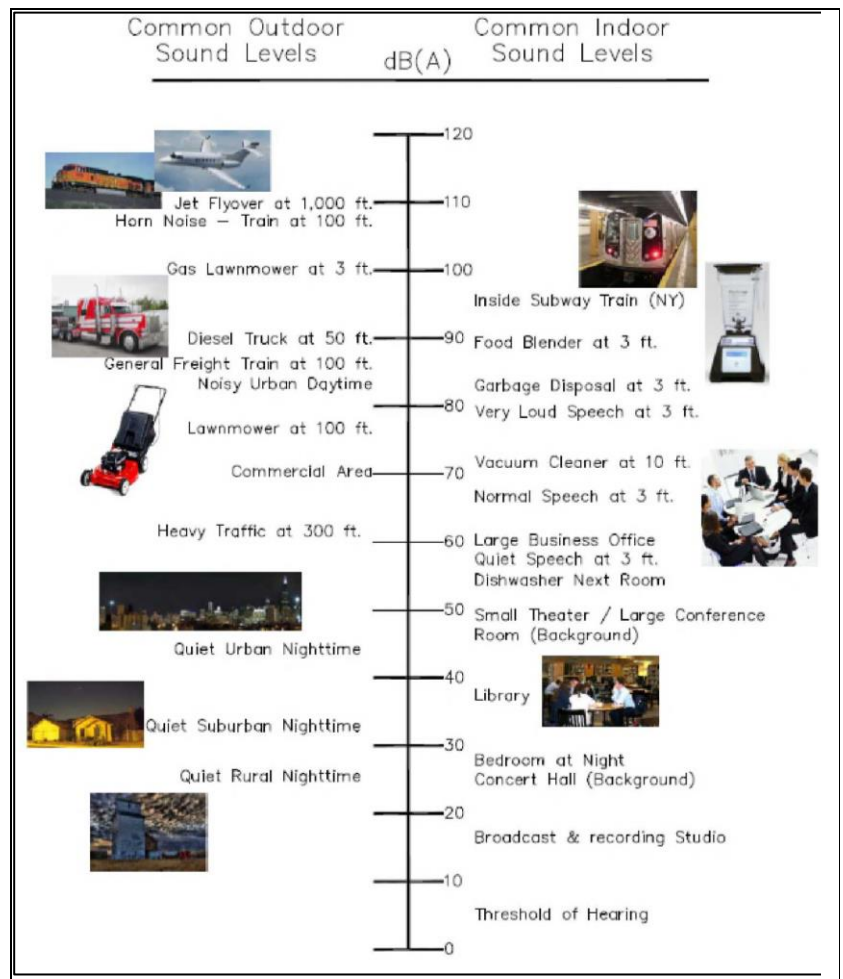
- Changes less than 3 dB(A) are not perceptible by a human with average hearing
- Changes from 3 to 5 dB(A) will be barely perceptible
- Changes greater than 5 dB(A) are readily perceived

*Primary Factors Influencing Traffic Noise:*

- **Traffic Volume:** Doubling the traffic volume typically increases the sound level by 3 dB(A)
- **Traffic Composition:** Trucks are typically louder than autos
- **Distance and Ground Cover from Road to Receptor:** When distance doubles, noise levels typically decline 3 dB(A) over hard surfaces and decline 4.5 dB(A) over soft surfaces
- **Traffic Speed:** Slow-moving traffic is quieter than faster traffic

### Traffic Noise Impact Determination

- Traffic noise is predicted for the existing, future no build, and future build conditions using the



<sup>1</sup> For more detailed information, reference the Illinois DOT Highway Traffic Noise Assessment Manual <http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Design-and-Environment/Environment/HighwayTrafficNoiseAssessmentManual.pdf>

Federal Highway Administration (FHWA) Traffic Noise Model, which is validated with field noise measurements.

- Traffic noise is predicted at representative receptors within 500 feet of the proposed improvements.
- Receptors are outdoor areas of frequent human use, such as benches, patios, balconies, and backyards. Receptors are selected for land uses identified by FHWA. Representative receptors are worst-case noise conditions for a Common Noise Environment, or CNE (area of similar land use and noise); one representative receptor is studied per CNE to determine noise impacts.
- Traffic noise impacts are determined by comparing future build condition model results to the FHWA Noise Abatement Criteria (NAC). *Receptors with **FUTURE BUILD CONDITION**<sup>2</sup> noise levels approaching (1 dB(A) below), meeting, or exceeding the NAC, as shown below, are considered to have a noise impact and will be studied for noise abatement.*<sup>3</sup>

Activity Category <sup>1</sup>	L <sub>eq</sub> (h)	Evaluation Location	Activity Description
A	57	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B <sup>4</sup>	67	Exterior	Residential.
C <sup>4</sup>	67	Exterior	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails and trail crossings.
D <sup>5</sup>	52	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E <sup>4</sup>	72	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	---	---	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	---	---	Undeveloped lands that are not permitted.

#### Indoor vs. Outdoor Noise

- The IDOT noise policy and FHWA noise procedures stipulate that outdoor areas of frequent human use shall be given primary consideration when determining noise impacts.
- IDOT and FHWA do not study interior noise for or provide abatement for private residences, as their analysis for residential areas focuses on noise levels that interfere with outdoor conversations.

<sup>2</sup> Traffic noise impacts are only determined for the build condition, as Illinois DOT does not have a noise barrier retrofit (Type II) program.

<sup>3</sup> Additionally, an impact would be identified if design year build traffic noise levels are predicted to substantially increase (greater than 14 dB(A)) over existing noise levels.

<sup>4</sup> Includes undeveloped lands permitted for this activity category.

<sup>5</sup> FHWA does not determine interior noise impacts for residential land uses. An interior noise analysis is completed only if no exterior areas of frequent human use exist.

- If a noise-sensitive land use does not have an outdoor use area, then interior noise levels for Category D uses only could be assessed. FHWA's *Highway Traffic Noise: Analysis and Abatement Guidance* states "Highway agencies may only consider noise insulation for public or non-profit institutional structures e.g., places of worship, schools, hospitals, libraries, etc." FHWA states that an indoor analysis shall only be done after completing an analysis of any outdoor activity areas or determining that exterior abatement measures are not feasible or reasonable.

### **Noise Abatement**

- Once a noise impact is identified, IDOT will evaluate feasible and reasonable noise abatement measures to reduce traffic noise impacts. IDOT states that at a minimum, noise barriers shall be considered to provide abatement to areas with a predicted traffic noise impact. Other factors to consider could include roadway horizontal and vertical realignment, traffic management measures, or noise insulation (applicable ONLY for Activity Category D land uses, after exterior abatement has been considered).
- A noise barrier must be FEASIBLE and REASONABLE to be implemented. An abatement analysis considers the following for each barrier studied:
  - *Feasibility*
    - *Is the barrier constructible?* (including considerations for safety, drainage, and utilities)
    - *Will the barrier reduce noise by 5 dB(A) or more at an impacted receptor?* (Traffic Noise Reduction Feasibility Criterion)
  - *Reasonability*
    - *Will the barrier reduce noise by 8 dB(A) or more at a benefited receptor?* (a barrier benefits a receptor if it reduces noise by 5 dB(A) or more)
    - *Does the barrier meet the IDOT cost-effectiveness criterion?* This weighs the cost of constructing the barrier compared to the number of receptors it would benefit.
    - *Is the barrier desired by the public?* If a barrier meets all other aspects of feasibility and reasonability, "viewpoint solicitation" is completed.

### **Noise Barrier "Viewpoint Solicitations"**

- Viewpoint solicitation determines if there is public support for a proposed noise barrier.
- Viewpoint solicitation is completed for each receptor benefited by a feasible and reasonable noise barrier. A benefited receptor includes property owners (including non-residential properties) and renters/leasers residing on the benefited property.
- These receptors will be asked to vote via mail if they want a noise barrier for their specific area.
- First row benefited receptors weighted as two responses. Benefited receptors not in the first row will count as one vote. For rental properties, the tenant = one response; owner = one response, per benefited unit (total of 2 responses/unit).
- If over 50% of the votes for a proposed barrier are in favor of the barrier, then the barrier will be implemented. If not, the barrier will not be implemented.
- IDOT plans to hold one or multiple public forums regarding viewpoints solicitations for I-290.

## **Frequently Asked Questions**

### **At what noise level could hearing damage occur?**

Generally, 120 dB(A) is recognized as the threshold of pain and considered a dangerous noise level. Noise levels less than 120 dB(A) can damage hearing if the listener is exposed to the noise for an extended time period. Noise levels less than 90 dB(A) are generally not recognized as noise levels that can cause hearing damage. Typically, traffic noise levels in areas of frequent human use do not approach these noise levels.

### **How loud is 67 dB(A)?**

A sound level of 67 dB(A) is associated with normal speech between two people three feet apart.

### **Were noise levels predicted for my house?**

Every house within 500 feet of the proposed transportation improvements is considered in the noise analysis, either directly or indirectly by representation in an area. Noise impacts are predicted at representative receptors for each Common Noise Environment (CNE). A CNE is an area with similar land use, distance to roadway, and topography. If a noise impact is determined at the representative receptor in your CNE, then ALL receptors are studied in the noise abatement analysis.

### **What are predicted noise levels for current and future no build conditions in the I-290 project corridor?**

The Eisenhower Expressway traffic noise analysis found that existing and future no build conditions in the project area typically approach, meet, or exceed the NAC for the first row of noise receptors adjacent to I-290. Although IDOT and FHWA identify traffic noise impacts only when noise levels approach, meet, or exceed the NAC in the future build condition, comparing the existing and future no build to the NAC is a good indicator of the noise environment without the proposed project or abatement in place.