Noise

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Noise Fundamentals and Terminology

Sound from highway traffic is generated primarily from a vehicle's tires, engine and exhaust and technically described in terms of the loudness (amplitude) of the sound and frequency (pitch) of the sound. The standard unit of measurement of the loudness of sound is the **Decibel (dB)**. Decibels are based on the logarithmic scale, as opposed to the more common linear units such as that of temperature. In terms of human response, most observers perceive an increase or decrease of 10 dB in the sound pressure level as doubling or halving of the sound. For example, 70 dB will sound twice as loud as 60 dB. In addition, studies have shown that a 3 dB increase or decrease is barely perceptible by the human ear.

Noise has been defined as unwanted sound. Highway traffic noise is a major contributor to overall transportation noise and is considered to be a line source of energy from which the energy levels dissipate vertically and laterally from the roadway. Traffic noise is not constant. It varies as each vehicle passes a point. The time-varying characteristics of environmental noise are analyzed statistically to determine the duration and intensity of noise exposure.

Noise metrics (measurements) can be divided into two categories: single event and cumulative. Single-event metrics describe the noise levels from an individual event such as an aircraft fly over or perhaps an emergency vehicle pass-by. Cumulative metrics average the total noise over a specific time period, which is typically 1 or 24-hours typically applied in evaluating community noise. For this type of analysis, cumulative noise metrics were used. For traffic noise, since humans are not equally sensitive to all frequencies, noise is adjusted or weighted using an A-weighted scale. The A weighting scale is widely used in environmental analysis because it closely resembles the nonlinearity of human hearing. **The unit of A-weighted noise is dB(A)**. Because highway traffic sounds fluctuate over time, an equivalent sound level is used to represent a single number to describe varying traffic sound levels. The noise standard used by the FHWA is related to the peak one-hour noise level and is described in terms of the Equivalent Noise Level (LEQ). The term **Leq (h)** refers to the energy-average noise level during the hour period, i.e., the average noise based on the acoustic energy of the sound. Peak hour noise refers to the hour with the highest Leq (h) whether or not it is the peak traffic hour. All traffic noise levels are expressed in dB(A) Leq (h).

Receptors are the "human ears" and the site location represents an area where frequent exterior human activity occurs. For residential dwellings, the receptor site location is generally the patio/backyard or front yard areas near the house structure.

Noise Impact Determination

The peak hour volumes and corresponding speeds for automobiles, medium trucks and heavy trucks result in the noisiest conditions.

Exterior noise impacts occur when noise levels are expected to reach 66 dB(A) Leq (h) for residential dwellings. Studies have determined that a noise level at 66 dB(A) Leq (h) is known to interfere with communication between people 3-6 feet apart.

Exterior noise impacts also occur when there is a substantial noise increase of future noise levels over existing noise levels defined as 15 dB or greater.

Results of the Analysis for the SH-99 Project

Noise Modeling

The analysis had utilized the FHWA Traffic Noise Model version 2.5 in accordance with FHWA 23 CFR 772 and complies with the ODOT Noise Policy dated July 13, 2011.

Sound levels determined for the existing condition year 2019 and the future condition design year 2046 based on roadway geometry, traffic volumes, terrain and receptor site locations.

30 single-family homes and 1-place of worship were analyzed for noise impacts.

Noise Model Validation

For purposes of validating the noise model, a precision sound level meter was utilized in conducting field measurements and traffic counts collected simultaneously at three (3) locations along existing SH-99 within the project limits. The model validation proved satisfactorily with all measured versus predicted levels being within ±3 decibel (dB) range; thus, the TNM 2.5 model developed for the study area would provide an acceptably accurate estimate of noise levels for the existing and future conditions.

Noise Impact Determination

Based on the proposed project and 2046 design year traffic volumes, future sound levels for all receptors evaluated are expected to range from 46.4 to 69.0 dB(A) Leq (h).

No substantial increases (+15 dB) in noise levels are anticipated, with the highest increase in future noise levels over existing levels being +4.1 dB.

Based on the future condition analysis (2046 Design Year), one (1) residential receptor (R-20) with a modeled future sound level of 69.0 dB(A).

Consideration for Noise Mitigation

Noise mitigation in the form of a free-standing noise wall placed within the project right-of-way is considered the most appropriate form of noise abatement measure for the impacted receptors involved.

The one impacted receptor has direct driveway access to SH-99 and, without access control, the gap that would be required for driveway connections would make noise abatement measures ineffective; therefore, noise mitigation would not prove feasible.

SH-99 SEMINOLE CO.

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