SECTION 8
NOISE IMPACT RATING

Introduction

Noise can be defined as unwanted sound which interferes with normal activities such as sleeping, conversation, or recreation, or which causes actual physical harm such as hearing loss, or which adversely impacts mental health (U.S. Department of Housing and Urban Development, 1985). Two types of noise are present in the community, ambient noise and point specific noise. The chief contributors to ambient (or background, or community) noise are the various transportation modes which operate in the community.

The dynamics of noise are based on the source of noise (generator), and the receiver (person or place), and the path noise follows from source to receiver. Sound in general has three primary characteristics. These are amplitude, frequency, and time pattern. Amplitude, which is perceived as loudness, is the measure of the difference between atmospheric pressure with no sound present and the total pressure with sound present. The unit of sound amplitude is the decibel (dB). The decibel scale is logarithmic rather than linear because the range of sound intensities is so great that convenient measurement requires compression of the scale (Environmental Protection Agency, 1978). Sound frequency is the rate at which a sound source vibrates or makes air vibrate. The term Hertz (Hz) is used to designate the number of cycles per second. The human ear appears to respond better to frequencies in the 500Hz to 8,000Hz. Sound has a temporal nature or characteristic which may be described in terms of its pattern of time and level: continuity, fluctuation, impulsiveness, and intermittency.

In the assessment used for this study, sound or noise measurements are expressed in terms of the day-night sound level (DNL) and expressed mathematically (in decibels) as Ldn. Thus, 50 Ldn means a day-night sound level of 50 decibels (dB). The expression DNL is defined as the A-weighted equivalent sound level for a 24-hour period with 10 decibels added for nighttime sounds (10:00 p.m.-7:00 a.m.). The day-night sound level is used to characterize average sound levels in residential areas throughout the day and night. The A-weighted sound level is the momentary magnitude of sound weighted to approximate the human ear's frequency sensitivity, which is better in the 500Hz to 8,000 Hz range. The DNL sound level includes a 10 dB penalty because people are more disturbed by noise at night.

In evaluating noise impacts, the U.S. Department of Housing and Urban Development (HUD) has set down noise standards to be used in evaluating new housing construction assisted or supported by HUD financing. These standards are as follows:

- 65 Ldn or less is judged acceptable;
- >65 Ldn but not >75 Ldn is judged to be normally unacceptable. HUD participation in the project requires the incorporation of sound attenuation measures in the design of the project; and,
- >75 Ldn is judged unacceptable.

Although HUD participation in this project is not anticipated, noise impacts here are appropriately evaluated utilizing HUD standards.

Pile Driving Equipment Noise Estimate

Sound decibel estimates for pile driving equipment was estimated from data collected by a major New Orleans construction company in March 1989. Utilizing sound dosimeters, noise readings were taken at the following points:

- At the pile driver (ground level);
- At 100 feet from the pile driver;
- At 350 feet from the pile driver (line of sight, but at a closed window in a nearby building).

The recorded sound levels for these locations were 100 dB, 55 dB, and 43 dB, respectively. Each of these noise measurements were converted to the corresponding DNL to measure average 24-hour noise exposure. The conversion equation is as follows:

Ldn = 10log10 1/24 [td X 10(Ld/10) + tn X 10 (Ln + 10)/10], where td = hours of daytime activity and tn = hours of nighttime activity.

In this equation, a 24-hour period is represented by 1/24. Although no pile driving activity would take place at night, the nighttime sound level (Ln) was increased by 10 dB in order to take into consideration the increased annoyance level of sound or noise at night and to build the worst case scenario. The ambient noise level, both day and night, was taken as 60 dB. An 8dB penalty was added to the actual noise reading to compensate for the annoyance created by loud impulsive noise.

Based on these considerations, the derived DNLs for the distances at which readings were taken are 120 Ldn, 69 Ldn, and 68 Ldn, respectively. It is understood that these levels represent a worst case scenario in terms of pile driving activity. Under this scenario, after application of a curve fitting technique to the known data points, the 75 Ldn contour would fall approximately 80 feet from the pile driver and the 65 Ldn contour could be expected to fall approximately 450 feet from the pile driver.

Literature Cited

U.S. Department of Housing and Urban Development. 1985. The Noise Guidebook. Office of Environment and Energy, Environmental Planning Division. Washington, D.C.

U.S. Environmental Protection Agency. 1978. Protective Noise Levels: Condensed Version of EPA Levels Document. Office of Noise Abatement and Control. Washington, D.C.