

Thurston County Noise Ordinance
Figure 1. Ambient Noise at East Property Line (120 feet from ORV track)

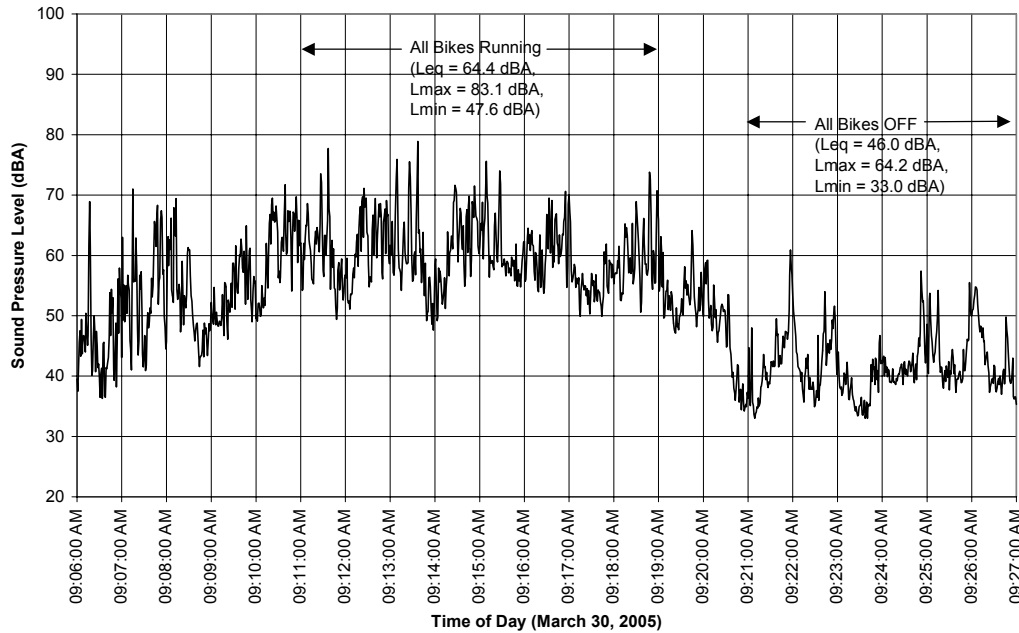
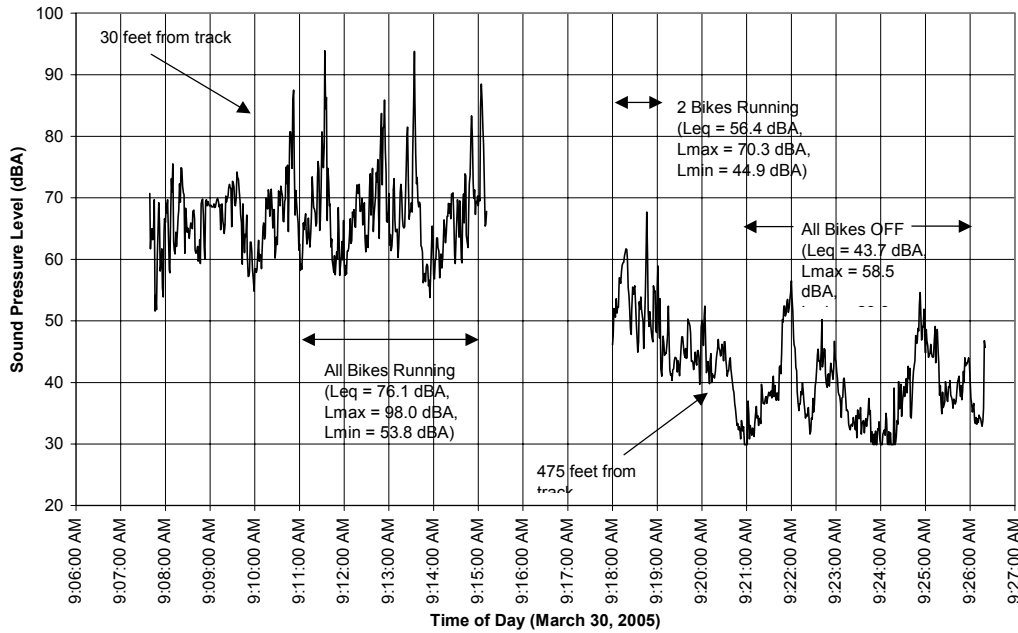


Figure 1 presents the measured A-weighted sound pressure level at the east property line with several bikes operating on the track. The property line was approximately 120 feet from the closest part of the track. The graph presents the sound level as a function of time. As you can see the A-weighted noise level is highly variable ranging from the mid 30's when there was little or no bike noise to 80 decibels when the noisiest bikes were closest to the microphone. A general discussion of sound and decibels is attached to help the reader understand the graph more fully. As you can see from the graph, the time average noise level (Leq) was 64.4 dBA when all bikes were operating. The ambient noise level was 46.0 dBA during the 6 minute period after the bikes stopped.

Figure 2 presents the measured A-weighted sound pressure level at two other locations. The first was only 30 feet from the closest part of the track. At this location the time average noise level was 76.1 dBA during the 4-minute time interval beginning at 9:11 AM. This is 12 dB higher than the sound level measured at the property line. The maximum noise level at this location was 98 dBA. I should point out that the maximum level shown on the graph is not exactly the same as the maximum sound level. That is because each data point on the graph is actually a 1-second average (Leq) sound level. The maximum sound level is not plotted. The actual maximum sound level of 98.0 dBA occurred sometime during the 1-second interval beginning at 9:13:34 AM when the 1-second Leq was 93.8 dBA. The second location shown in Figure 2 was measured 475 feet from the track in the neighbor's front yard. The 1-minute time average (Leq) noise level at this location was 56.4 dBA with two bikes on the track. The 5-minute time average (Leq) ambient noise level at this location was 43.7 dBA, and the minimum sound

level was 29.9 dBA. This is a very low ambient noise level. When the ambient noise level is very low like this, even moderate sound levels will be perceived as noisy.

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Figure 2. ORV and Ambient Noise at 2 Locations



I understand that the County Commissioners are considering a plan to adopt a new noise ordinance for Thurston County. I would strongly support this effort. I also understand that they are concerned about the complexity of the existing Washington State Noise Ordinance, and the difficulty of evaluating compliance when the source of noise varies in sound level (like the noise from ORVs). My recommendation is to adopt the maximum allowable sound levels from WAC 173-60-040, but do not adopt the adjustments in paragraph (c). Instead of these complicated adjustments, simply require that the time-average A-weighted sound pressure level (Leq measured over any 5-minute time interval) not exceed the values shown in the table found in WAC 173-60-040, and that the maximum sound pressure level over any time period (measured with a fast time constant) not exceed the tabulated values by more than 15 dBA. This approach is not exactly the same, but it is very close to the requirements of the existing ordinance. The best thing about this approach is that compliance can be determined quickly just by viewing the display screen of a \$1,500 integrating sound level meter equal to a Bruel & Kjaer model 2240 (see www.bkhome.com for more details on this meter).

Environmental Noise Descriptors

Noise is always present in the environment. Noise is generated by both natural phenomena (e.g. wind, water flowing in a stream or river) and by man-made machinery (e.g. motor vehicles, aircraft, ventilation fans). Noise can have both positive and negative impacts on the environment. The steady sound of a distant waterfall or a quiet fan can provide a soothing background noise to promote sleep and/or “mask” other annoying sounds that may be in the environment. Sounds that are too loud, too abrupt, or simply unwanted (e.g. music from someone else’s property) may disrupt sleep, impede speech communication, or simply create annoyance.

The level (which is proportional to loudness as perceived by humans) of environmental noise is measured in terms of A-weighted decibels, abbreviate dBA. Most outdoor environments have noise levels that fall into the 30 to 100 dBA range. Occasionally you will find noise levels outside this range, but it is a very rare occurrence. A noise level of 0 dBA is the approximate threshold of human hearing. Noise at or below this level exists only inside specially designed acoustical test chambers. At the other extreme: the approximate threshold of pain for most humans is 120 dBA. The noise of gun fire at close range can exceed this level for a brief period of time. A level above 120 dBA is also typical of a military jet engine during take-off, if the listener is within 100 feet of the aircraft. Table 1 presents a summary of typical sound levels associated with various sources of noise.

Table 1. Typical Sound Levels

Noise Source	Distance (feet)	Noise Level (dBA)
Military Jet @ Takeoff	100	100 to 120
Chain Saw	5	90 to 100
Heavy Truck @ 50 mph	50	80 to 90
Automobile @ 50 mph	50	65 to 75
Normal Speech	5	55 to 65
Indoor Air-Conditioner	5	45 to 55
Refrigerator	5	35 to 45
Ticking Clock	5	25 to 35

It is also important to understand the importance of a change in noise level, particularly when evaluating noise impacts. Although a doubling of the number of equal noise sources yields a 3 dB increase in the total noise level, it takes an increase of 10 dB to create a perceived doubling of the loudness of a noise. This relationship applies to all types of noise (except for very low frequency noise). Therefore, increasing the level of noise from 40 dBA to 50 dBA would be perceived as a doubling of the loudness, as would an increase from 78 dBA to 88 dBA. Conversely, reducing a given noise level from 94 dBA to 84 dBA would be perceived as a 50% reduction in the loudness. A 5 dBA increase or decrease is generally perceived as clearly noticeable and significant. A change in level of only 1 dBA is generally too small to

be detected, except under very special (laboratory-like) conditions. In general, it takes a 3 dBA change to be noticed by the casual listener, unless the “character” or “quality” of the sound is changed significantly. These “rules of thumb” are applicable to sounds of similar quality. If a new noise source is added to an existing environment, and the new source has a unique character to it, it often can be heard at very low levels. In fact, sounds containing pulsating tones (e.g. back-up beepers) can easily be heard at sound levels as low as 10 to 15 dBA below the hourly average ambient noise level.

In general, the noise level at any location is almost never constant. The noise level will typically fluctuate with time and location. However, when averaged over a significant time period (e.g. several minutes or an hour), most outdoor environments will exhibit a reasonably steady noise level. The most significant outdoor noise level statistic is the energy average noise level, abbreviated Leq (which stands for equivalent sound level). The Leq is defined as the steady (constant) sound level that has the same total acoustic energy as the actual time-varying sound level. The Leq can be measured over any time interval, but usually an interval somewhere in the range of 1 minute to 1 hour is used. Other important noise level statistics include the Lmax (which is the maximum sound level during an interval of time), the Lmin (which is the minimum sound level during an interval of time), and the L₉₀. The L₉₀ is a statistic defined as the sound level that is exceeded 90% of the time interval (i.e. the noise level is below the L₉₀ value only 10% of the time interval). It is usually controlled by noise sources very far from the measurement location. The L₉₀ is often called the “background noise level” as opposed to the ambient noise level (which includes all noise sources, both near and far).

There is one other important noise level statistic: the day-night average sound level, abbreviated Ldn or DNL. The Ldn is a 24-hour average noise level (with a built-in penalty for nighttime noise) that is most often used in reference to land use compatibility. By convention, the day-night sound level is expressed in units of dB (not dBA like Leq) even though the measured values are A-weighted decibels. In 1974 the federal government has identified an Ldn of 55 dB as the maximum noise level for residential property “requisite to protect public health and welfare with an adequate margin of safety.”