



Houston Minnesota OHV Trail System

Acoustic Property Survey and Analysis **Preliminary Report**



Presented by:
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Typical Community Noise Concerns



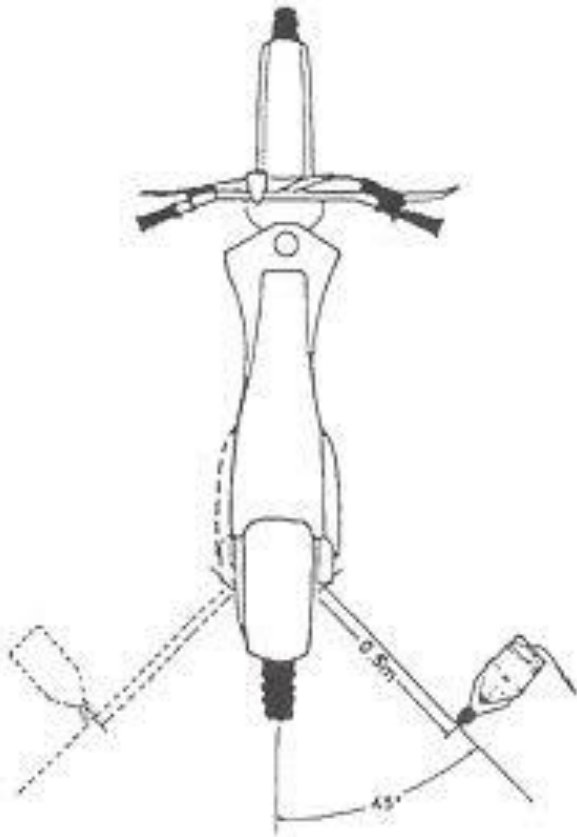
Executive Summary

- OHV Acoustics was contracted to run acoustic tests for the Houston OHV Trail System
- Eight vehicles rode the trails at the site to generate typical OHV sound levels
- All eight vehicles passed the Minnesota J1287 stationary regulation
- Test sites were located at the property line and tests run per Minnesota Rules Chapter 7030 part 7030.0040
- All test sites passed the Minnesota L10 and L50 regulatory sound limits
- Testing per the Federal HUD 24CFR Part 51 regulation for high density housing was also run for documentation purposes only; it was not required for this property. The Houston OHV Trail System as well as the test sites in the City of Houston itself passed the Federal HUD regulation 65 dBA Leq level limits.
- OHV sound levels generated at the OHV Trail System did not exceed any local, state, or Federal sound regulation limits.

Current Applicable Noise Standards

- Minnesota 7030.0044 Noise Standard
- Limit L10 65 dBA and L50 60 dBA Daytime
 - L10 55 dBA and L50 50 dBA Evening (10PM to 7AM)
- DNR SAE J1287 Stationary sound test
 - 99 dBA at 20 inches/0.5 meters 50% rpm at a 45 angle for 4X4/trucks, ATV, UTV
 - 96 dBA for OHM (Off Highway Motorcycles)
 - (3 dBA less allowed than other motorized)
 - Used by State Patrol, DNR, and other enforcement agencies
 - Compliance will be required by the City of Houston for all off road vehicles used on this property.

SAE J1287 Stationary Sound Test



Test rpm 50% of peak power
OR
50% redline, 3 dBA allowance over limit

99 dBA limit per Minnesota DNR
Jeeps/trucks/ATV/UTV

96 dBA limit OHM

Typical Sound Levels



HUD Limit
65 dBA Leq
(Time averaged)

SAE J1287 Stationary Sound Test Results

Houston Minnesota Trail System sound survey

Regulatory Limit: **99 dBA** 4X4/trucks, ATV, UTV.

96 dBA for OHM's

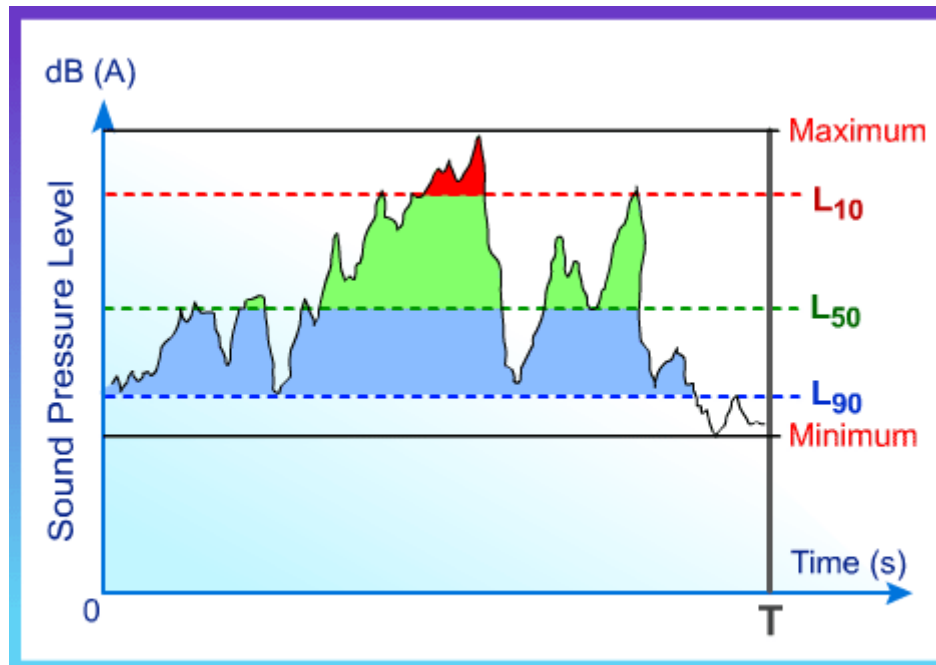
Vehicle	Test RPM	dBA	Limit dBA
• Jeep Wrangler	3250	79	99
• Jeep Wrangler	3250	96	99
• UTV Polaris Ranger 800	3000	94	99
• UTV John Deere Gator	2800	82	99
• ATV 1985 Honda Rincon	3500	85	99
• Honda CRF 450	3700	93	96
• Kawasaki KLX 140	3000	88.7	96
• Kawasaki KLX 140	3000	88.0	96

All vehicles passed J1287 stationary sound level limits

Definition L10 and L50 Sound Levels

L10 is the level exceeded for 10% of the time. For 10% of the time, the sound or noise has a sound pressure level above L10. For the rest of the time, the sound or noise has a sound pressure level at or below L10. These higher sound pressure levels are probably due to sporadic or intermittent events. L10 is often used when assessing [traffic noise](#) and in planning applications: L10 is the level exceeded for 10% of the time and takes account of any annoying peaks in noise.

L50 is the level exceeded for 50% of the time. It is statistically the mid-point of the noise readings. It represents the median of the fluctuating noise levels.



Please note that $L_{10} > L_{50} > L_{90}$ for the same sound or noise.

Property line sound test results for L10 and L50

- Test site 1 using Bruel & Kjaer 2245
 - 1 hour time averaged
 - Daytime L10 49.4 dBA (Limit 65 dBA)
 - Daytime L50 45.1 dBA (Limit 60 dBA)
- Test site 2 using Extech 407780A
 - 1 hour time averaged
 - Daytime L10 57.7 dBA (Limit 65 dBA)
 - Daytime L50 52.2 dBA (Limit 60 dBA)
- Both sites below regulatory Minnesota sound limits

Sound test equipment used



Bruel & Kjaer model 2230
Sound level meter
Type 1



CE Occupational Health Dynamics sound
calibrator

Bruel & Kjaer 2245
Sound level meter
Type 1



Extech 407780A
Sound level meter
Type 1



Sound Level versus Distance

- 6 dB drop per doubling of distance
 - Example: 96 dBA at 4 feet from noise source
 - 90 dBA at 8 feet
 - 84 dBA at 16 feet
 - 78 dBA at 32 feet
 - 72 dBA at 64 feet
- 6 db increase with distance cut in half
 - Example: 40 dBA at 80 feet from noise source
 - 46 dBA at 40 feet
 - 52 dBA at 20 feet
 - 58 dbA at 10 feet
 - 64 dBA at 5 feet

Adding sound levels

- Sound Level Math (Logarithmic)
 - 80 dB + 80 dB = 83 dB
 - Double the sound level for every 3 dB change

dBA Sound Calculation Example

Add 2 vehicles: 58.5dBA + 61.4dBA

$$\begin{aligned}L_{\Sigma} &= 10 \cdot \log_{10} \left(10^{\frac{L_1}{10}} + 10^{\frac{L_2}{10}} + \dots + 10^{\frac{L_n}{10}} \right) \text{ dB} \\ &= 10 \text{ Log}_{10} \left(10^{\frac{58.5}{10}} + 10^{\frac{61.4}{10}} \right) \\ &= 10 \text{ Log}_{10} (707945.78 + 1380384.27) \\ &= 10 \text{ Log}_{10} (2088330) \\ &= 63.19 \text{ dBA}\end{aligned}$$

Federal Residential Noise Standard

HUD 24CRF Part 51 Environmental Criteria and Authority
Requirements for new housing construction

- Daytime exterior noise - $Leq \leq 65$ dBA are acceptable
- Nighttime exterior noise - $Leq \leq 55$ dBA are acceptable
- Equivalent Sound Level (Leq) = level of steady state sound with same A-weighted sound energy as time varying sound in a stated time period.
- This regulation is for high density residential area such as near an airport or large housing developments
- The area in discussion is not zoned high density residential
- **This test was run for documentation purposes only**

Sound test results Federal HUD residential areas

- Test site 3 using Bruel & Kjaer 2230
 - City Hall entrance
 - 1 hour time averaged
 - 56.1 dBA Leq
- Test site 4 using Bruel & Kjaer 2230
 - Nature Center entrance
 - 1 hour time averaged
 - 52.1 dBA Leq
- Test site 5 using Bruel & Kjaer 2230
 - Private residence 418 Grant Street Houston
 - 1 hour time averaged
 - 56.4 dBA Leq

Federal HUD sound limit high density residential area 65 dBA daytime

All three city sites were Federal Hud sound compliant.

Design for quiet/erosion/safety

- Current testing based on existing trails. As more trails are added keep in mind their locations impact on the park sound signature.
- Keep trails away from the neighbors if possible. Use setbacks/buffers.
- Avoid erosion issues. Use rolling dips and switchbacks on hills.
- Twisty trails reduce speed and vehicle time at sustained throttle. Reduces noise considerably.
- No straight up hill climbs. Higher noise, more erosion.
- Have play areas well within the property interior. Reduces property line noise.
- Have trail markers with point locations (GPS?). Find injured riders easier.
- More trails spreads out riders, reduces maintenance on the trails.
- Under Houston control this site will become a nature preserve. Narrow trails take up very little space and quickly become deer paths. This sanctuary will become a haven for deer, birds, turtles laying their eggs, frogs, fox, rabbits, and all other 4 footed and flying mammals. They get used to the traffic and the sound hints someone is coming, be alert.

Minimizing Noise

- Buffer zone at property line (typically 100 feet)
- Place quiet activity trails nearest the property line (hiking, equestrian, mountain bikes)
- Plant evergreens around property line, especially at neighbors. Foliage reduces noise.
- Berms/trees/shrubs at property line. Activities out of sight, out of mind.
- Parking lots not at property line, move more to interior.
- Parking lot entrances away from neighbors.
- Sound check all motorized vehicles using the property. Buy a meter that includes Leq, L10, and L50 capabilities for any future sound projects. Share the sound meters with city.
- Train users of the sound level meter.
- Post operational hours of the park. No riding 10pm to 7am.
- NOHVCC a great partner in trail system development and operations. Free.

OHV Acoustics

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