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August 25, 2015

NOISE SIMULATION
Proposed Vehicle Test Track
StoneGate AutoPlaza, 207th and Metcalf
Johnson County Kansas

Simulation conducted by Bob Coffeen, FASA, and by Logan Pippitt

On Sunday August 16, 2015 and per the request of the Johnson County Planning Department a simulation of potential vehicle test track noise was conducted at the proposed track location. Recorded vehicle noise was reproduced at the recorded levels from loudspeakers located at the assumed location of the east track just south of the northeast curve. Listening was accomplished along Metcalf and at the southeast corner of 199th and Metcalf.

Following is a description of the simulation and the results of our listening.

NOISE MEASUREMENT, RECORDING, AND REPRODUCTION

Vehicle noise and its recording: A Shelby Cobra without mufflers is a very noisy vehicle and the highest sound pressure levels produced by this vehicle were found to be with the vehicle being driven on 207th Street. The recording location was approximately as indicated by Figure 2. Sound levels were measured at approximately 35 feet from the passing car using the following measurement devices and the resulting maximum noise levels were found to be as indicated by the table that follows.

Figure 1 Approximate location of vehicle noise recording

An Earthworks M-30 omnidirectional condenser instrumentation microphone was connected to a Studio Six Digital iInterface2 audio interface unit which was connected to an Apple iPad Air 2 running Audio Tools software, specifically the Audio Tools Real Time Analyzer. The microphone was calibrated using a professional microphone

calibrator and vehicle noise recording was accomplished by an Edirol R09 wav file recorder.

Maximum noise levels due to the passing vehicle on 207th Street and at approximately 35 feet from the vehicle were found to be as follows:

	Octave Frequency Band Center Frequency - Hz								
Level – dB re 20 µPa	31.5	63	125	250	500	1000	2000	4000	8000
	74	88	89	90	82	80	79	75	72

These octave frequency band sound pressure levels when properly combined indicate an overall level of approximately 94 dBC.

Vehicle noise reproduction: An Electro-Voice Sx100 full range loudspeaker and a Bose MB4 low frequency loudspeaker were located at the approximate location of the east track and somewhat south of the northeast track curve. The frequency response of these loudspeakers was adjusted to be uniform with frequency when measured in octave frequency bands at a microphone distance of approximately 35 feet using the same measurement system as described above. Loudspeaker frequency response adjustment was accomplished by a Shure 4800 digital signal processor. The Shure 4800 also provided a frequency crossover for the two loudspeakers. The vehicle noise recording (wav file) on an SD card was transfered to a Dell E5440 notebook computer for easier playback. The output of the computer was supplied to a Mackie 1402 VLZ mixer and the output of the mixer was fed to an Electro-Voice 2 channel power amplifier which powered the loudspeakers. Approximate location and orientation of loudspeakers is shown by Figure 2.

The vehicle noise was reproduced at a distance of approximately 35 feet from the loudspeakers at the maximum octave frequency band levels measured for the passing Shelby Cobra vehicle on 207th Street. Loudspeakers were oriented towards the northeast in the direction of the residential areas. Wind was from the southwest and of moderate velocity.

Figure 2 Approximate Location and Orientation of Loudspeakers

LISTENING IN THE RESIDENTIAL AREA

Listening was accomplished by Paul Greeley and Bob Coffeen along with the occupants of the residence at 7701 W. 202nd Terrace. At this location the vehicle noise could be detected but it was judged not to be disturbing. It was significantly lower in level when compared with vehicles passing by on Metcalf.

At the residence just south of this first listening location, located at 20305 Metcalf, the noise could be identified as vehicle noise but again it was not disturbing and lower in level then noise from vehicles on Metcalf.

Listening father north, at the Stilwell Station parking lot at 199th and Metcalf, the simulated vehicle noise could not be detected.

VEHICLE NOISE SIMULATION RESULTS

This noise simulation exercise indicated that the proposed vehicle test track should not be disturbing for the existing residences located northeast of the track. However, it is suggested a noise limitation be established as follows:

> Vehicle noise levels restricted to a maximum of 95 dBC when measured at a distance of 50 feet northeast of the east and northeast side of the track. Note that this suggested vehicle noise level is a maximum level and not an equivalent sound level determined over some time period.

NOISE SIMULATION ASSISTANCE AND COOPERATION

The following listening, assistance, and cooperation was most helpful and appreciated:

Assistance and listening provided by Paul Greeley of the Johnson County Planning Department.

Assistance and cooperation by Joe Effertz, owner of the StoneGate AutoPlaza, and by Jerry Weidenmann, owner and driver of the Shelby Cobra vehicle.