



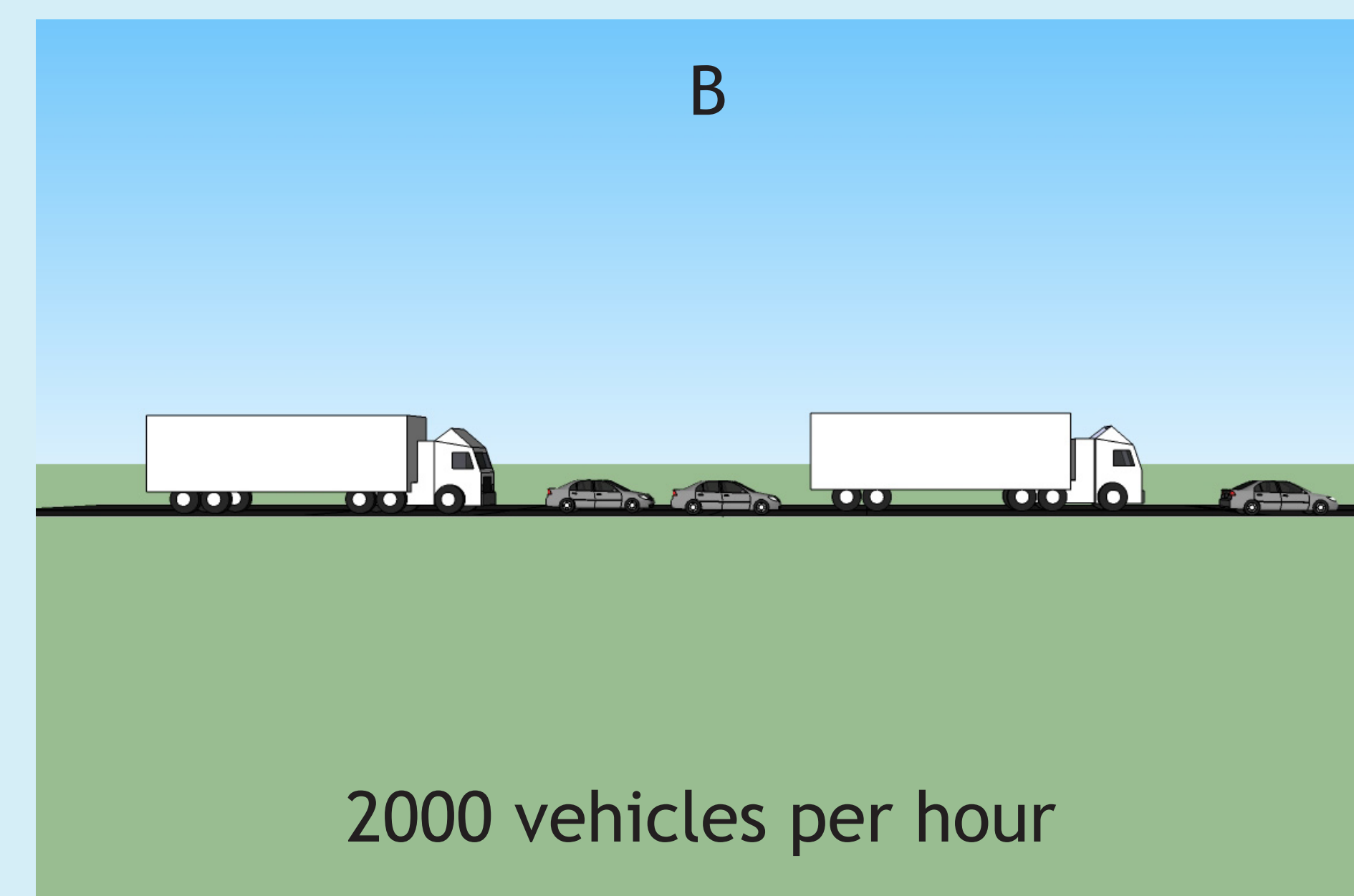
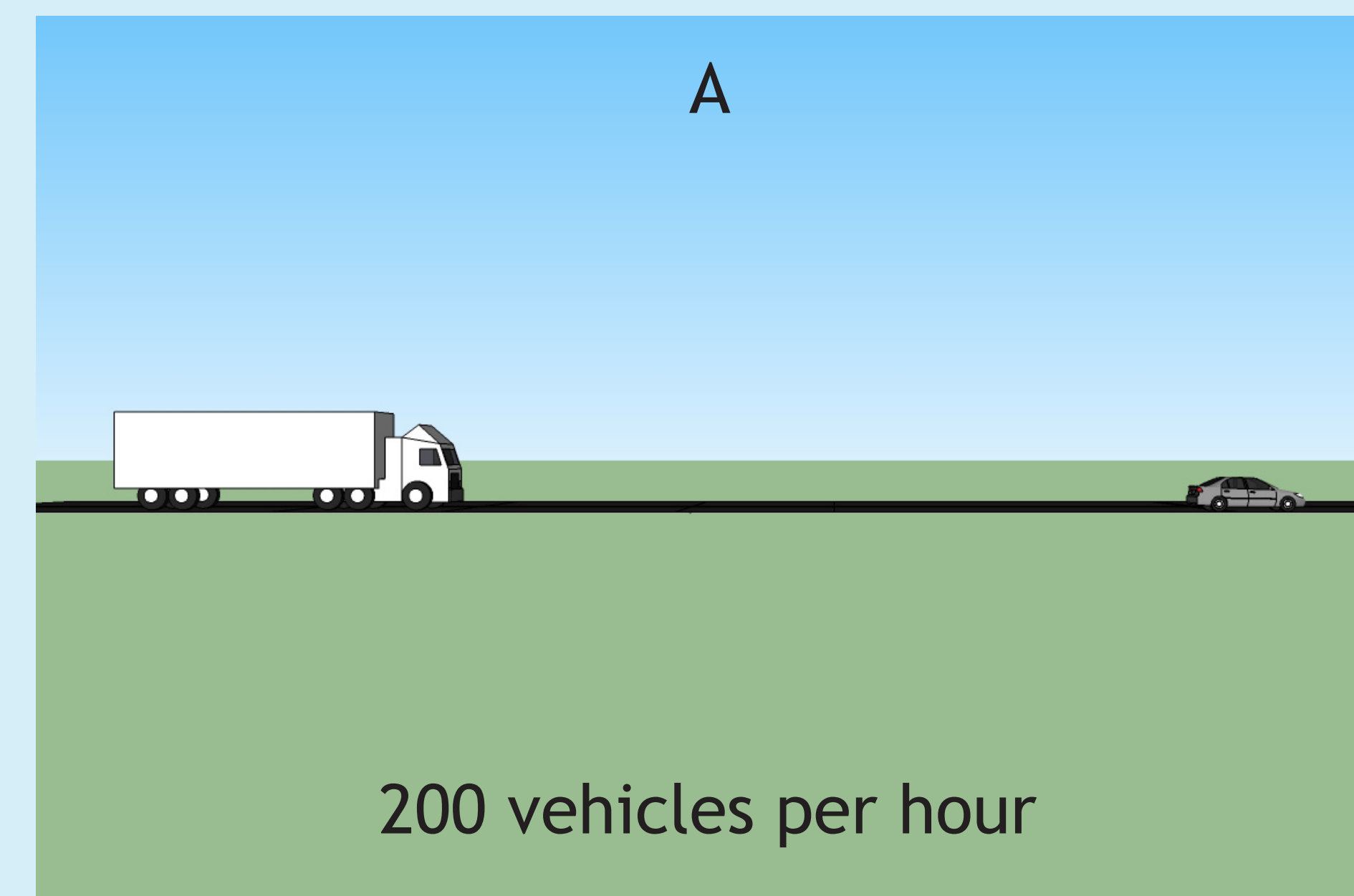
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DULLES TOLL ROAD

Science of Noise

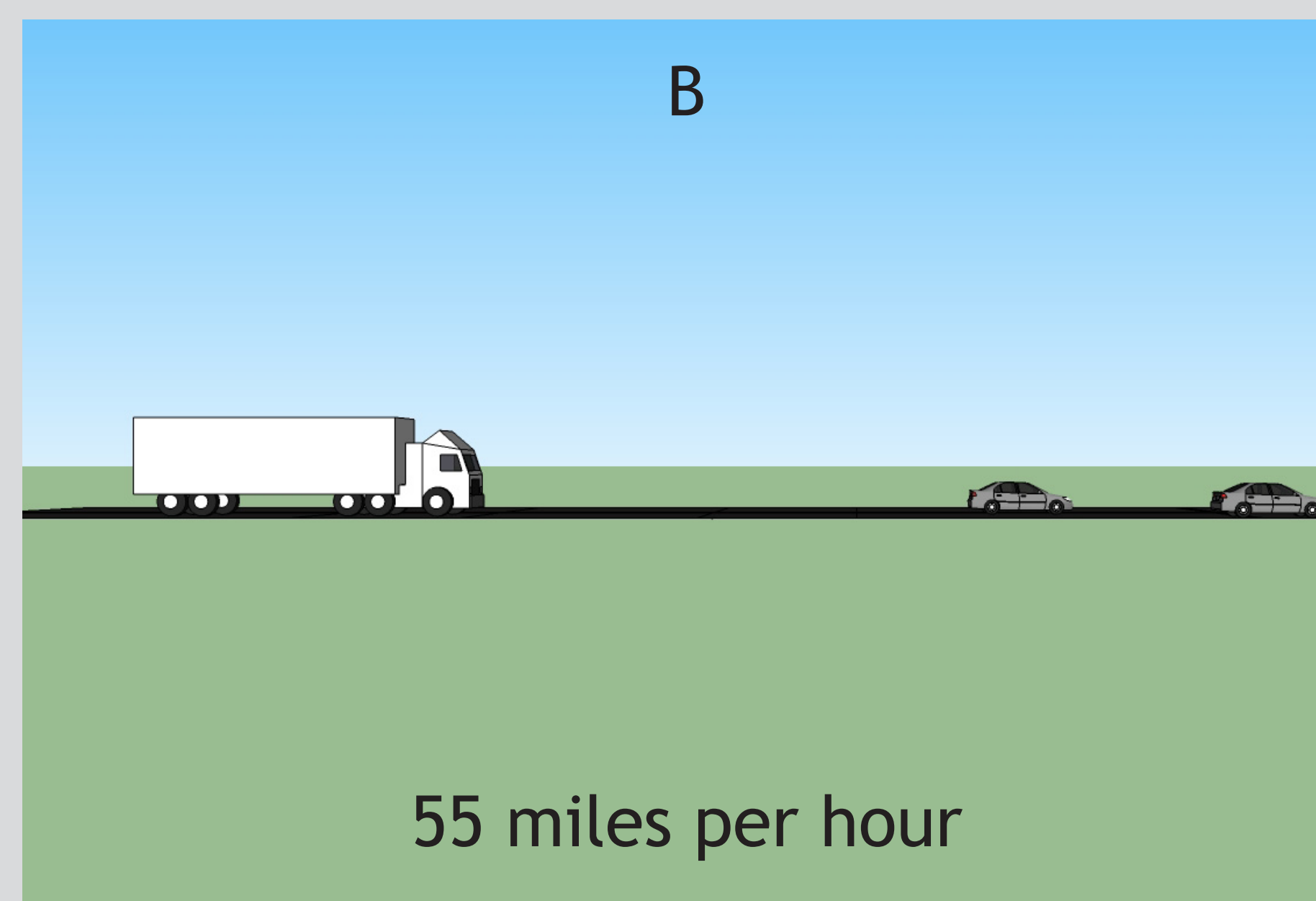
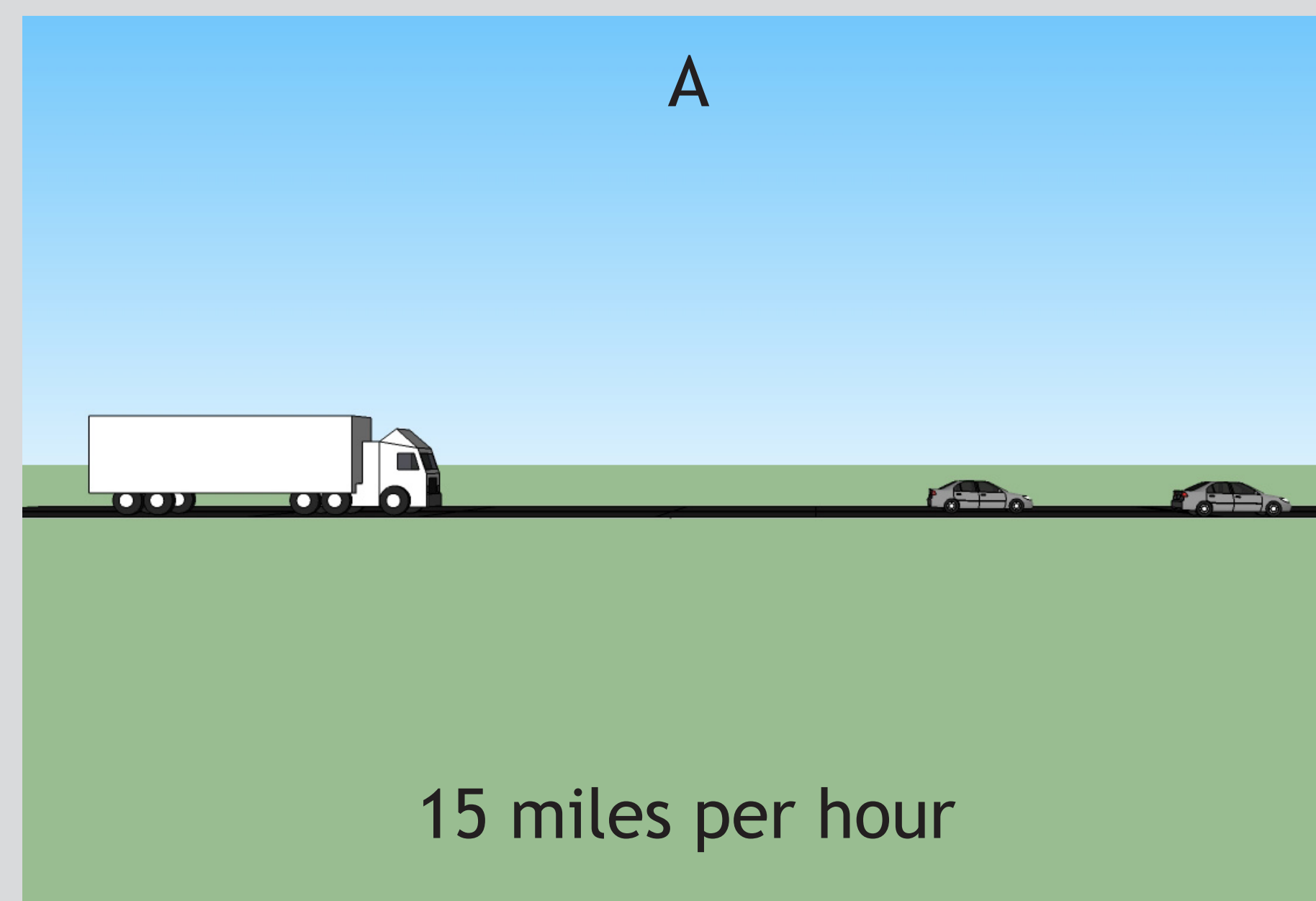
Causes of Traffic Noise

How Traffic Volume Affects Noise



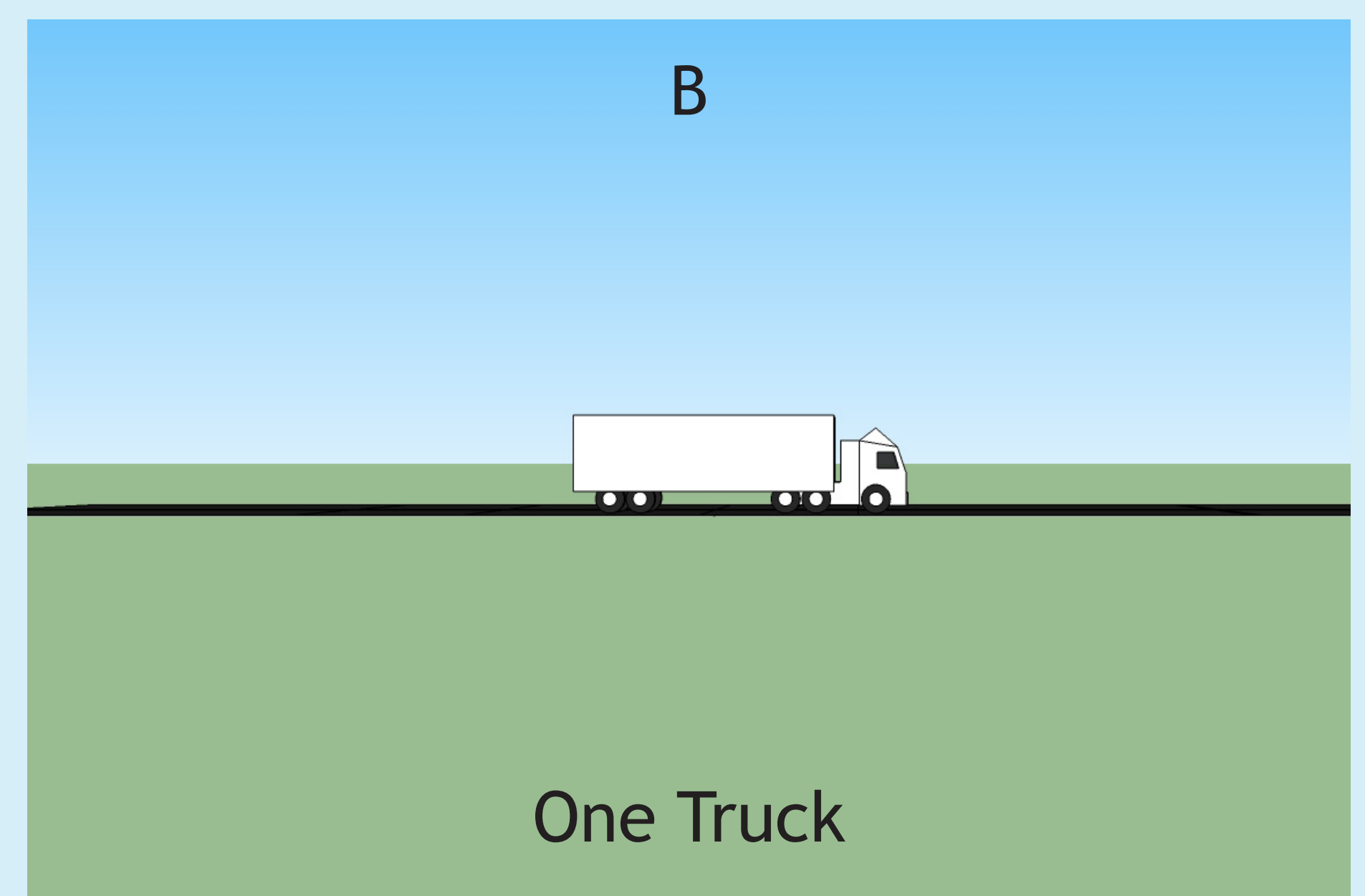
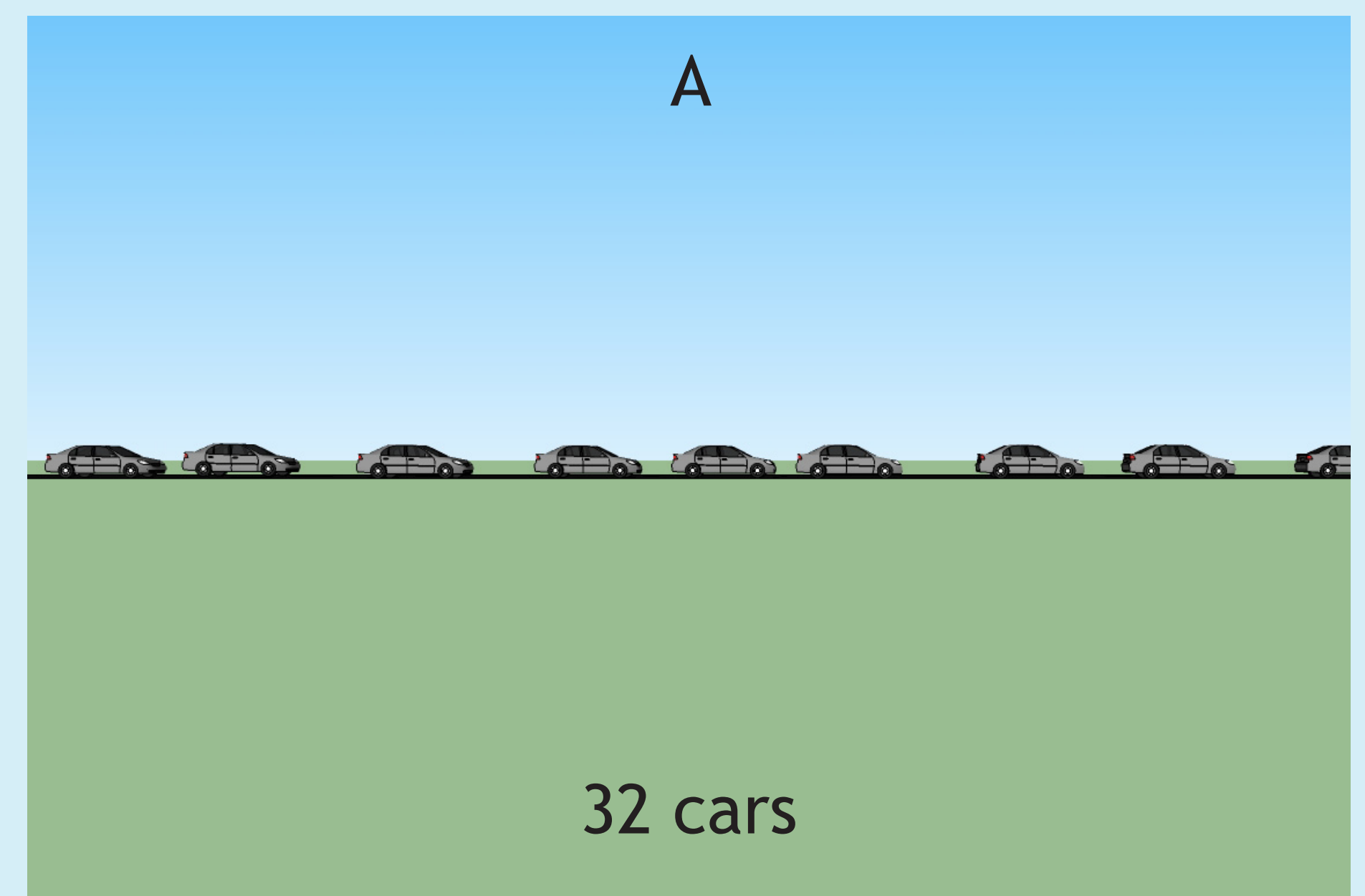
A sounds half as loud as B

How Speed Affects Traffic Noise



A sounds half as loud as B

How Trucks Affect Traffic Noise

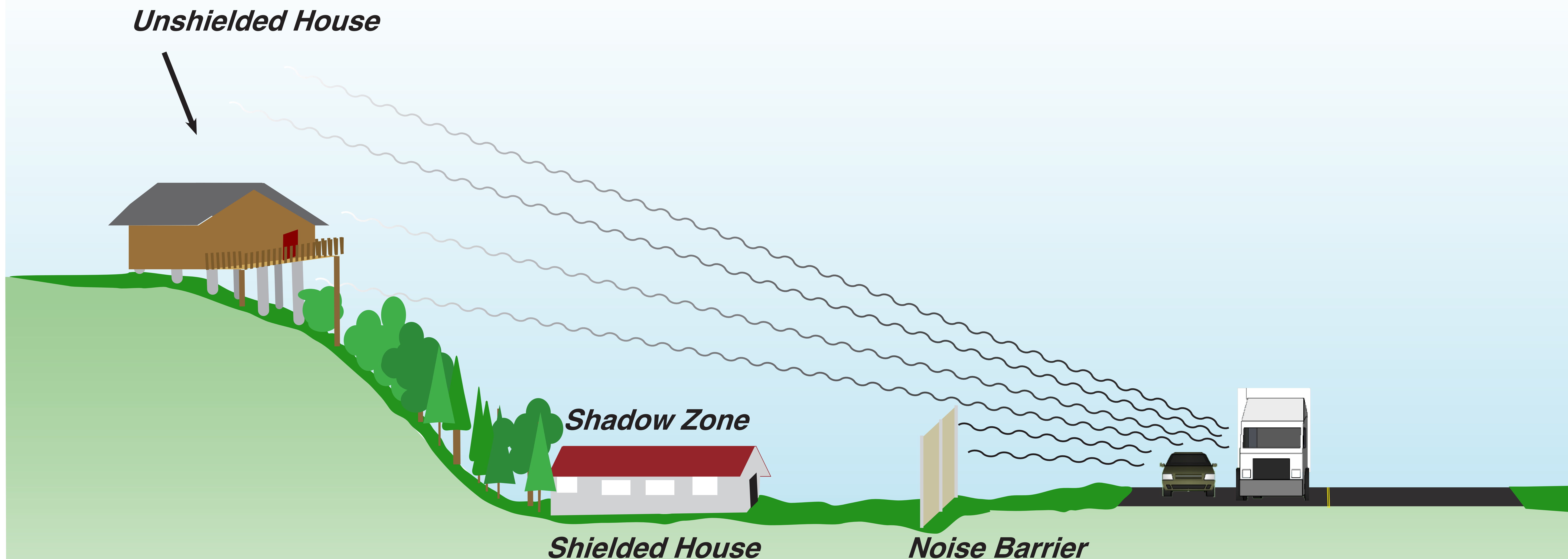


A sounds as loud as B

Source: VHB, based on an illustration in FHWA's Highway Noise Introduction brochure.



Noise Barrier Effect



Shadow Effect of Noise Barrier

The lower house is protected by the barrier, but the upper one is not.

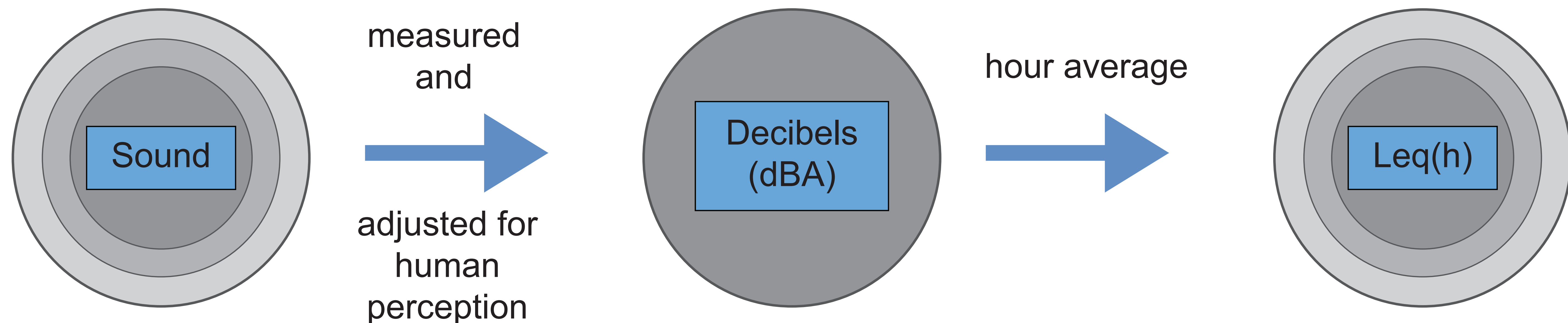
Source: VHB, based on *Highway Traffic Noise Analysis And Abatement Policy And Guidance*, U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch, Washington, D.C. June 1995



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Sound and Noise

- ❖ Sound, created when an object moves air, is comprised of a spectrum of frequencies.
- ❖ Sound is quantified by a meter which measures units called decibels (dB).
- ❖ Humans are sensitive to certain frequencies and insensitive to others.
- ❖ Decibels adjusted for an average person's hearing are called "A-weighted levels" (dBA).
- ❖ $Leq(h)$ is the constant, average sound level, over a one hour period used in the U.S. as the preferred highway noise metric.



Relative Noise

NOISE PERCEPTION

SOUND LEVEL CHANGE

RELATIVE LOUDNESS CHANGE

+30 dBA _____	8 TIMES AS LOUD
+20 dBA _____	4 TIMES AS LOUD
+10 dBA _____	TWICE AS LOUD
+5 dBA _____	READILY PERCEPTIBLE INCREASE
+3 dBA _____	BARELY PERCEPTIBLE INCREASE
0 dBA	REFERENCE
-3 dBA _____	BARELY PERCEPTIBLE DECREASE
-5 dBA _____	READILY PERCEPTIBLE DECREASE
-10 dBA _____	HALF AS LOUD
-20 dBA _____	1/4 AS LOUD
-30 dBA _____	1/8 AS LOUD

Source: VHB, based on *Highway Traffic Noise Analysis And Abatement Policy And Guidance*, U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch, Washington, D.C. June 1995



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