



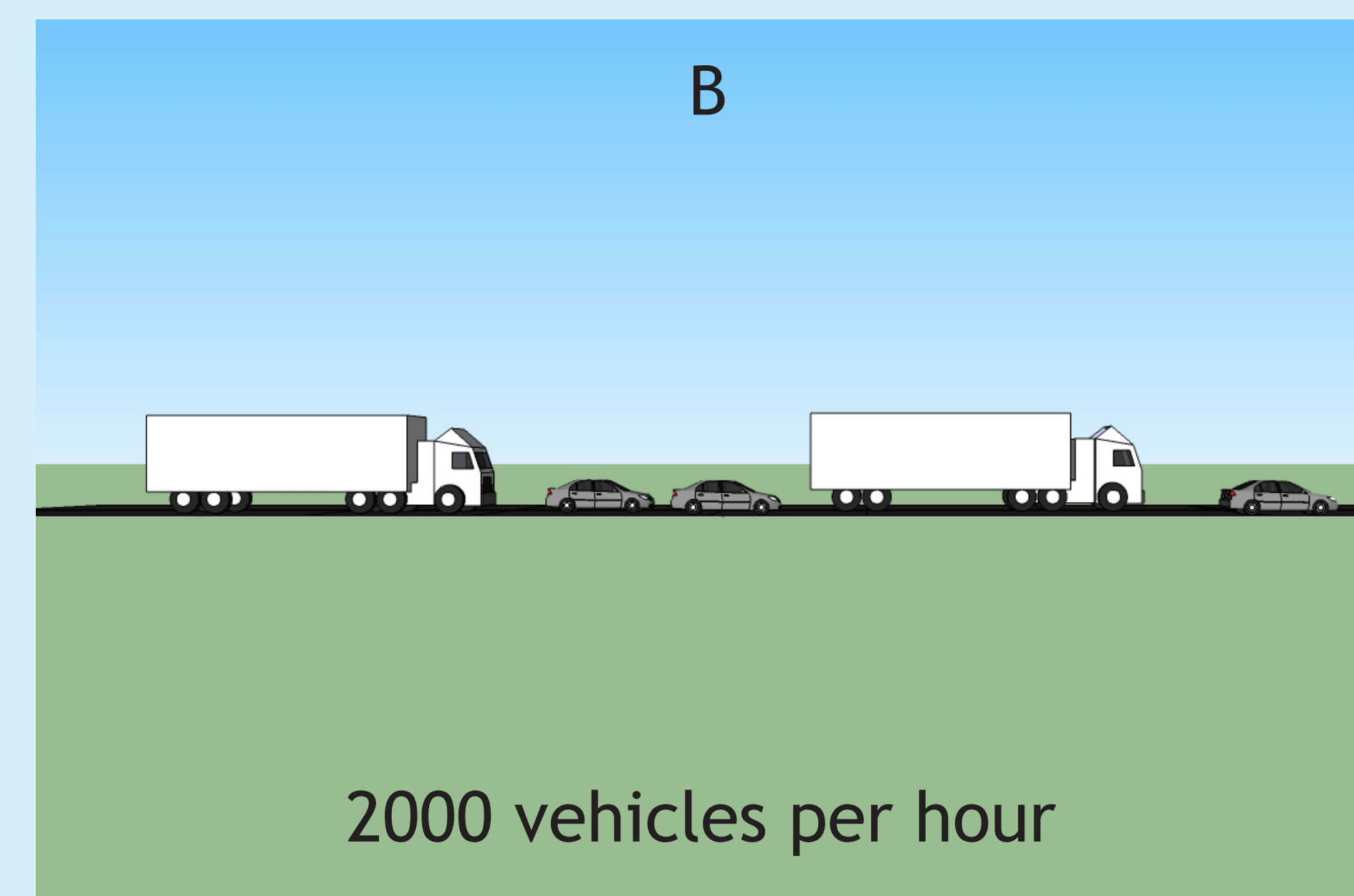
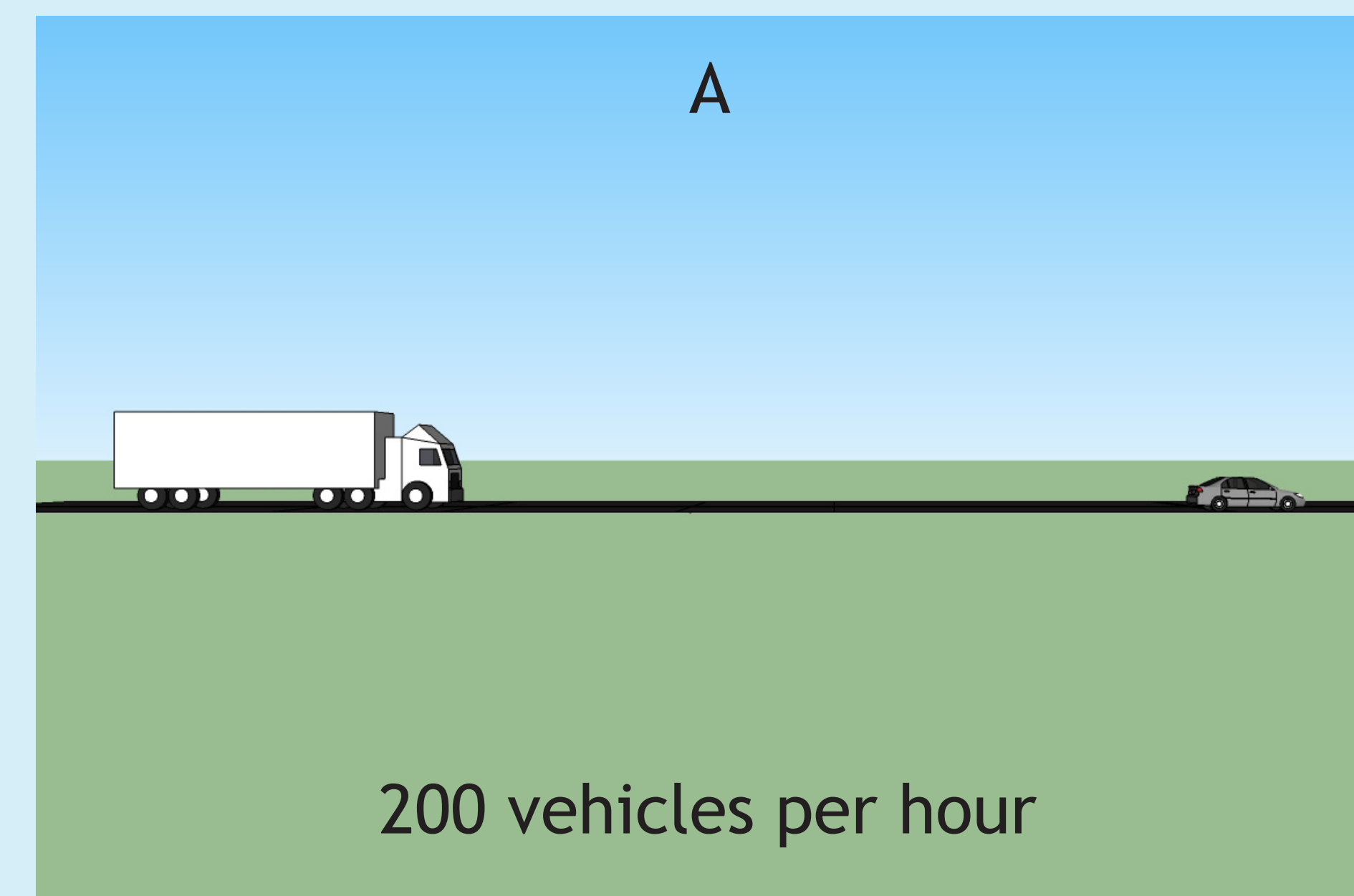
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DULLES TOLL ROAD

Science of Noise

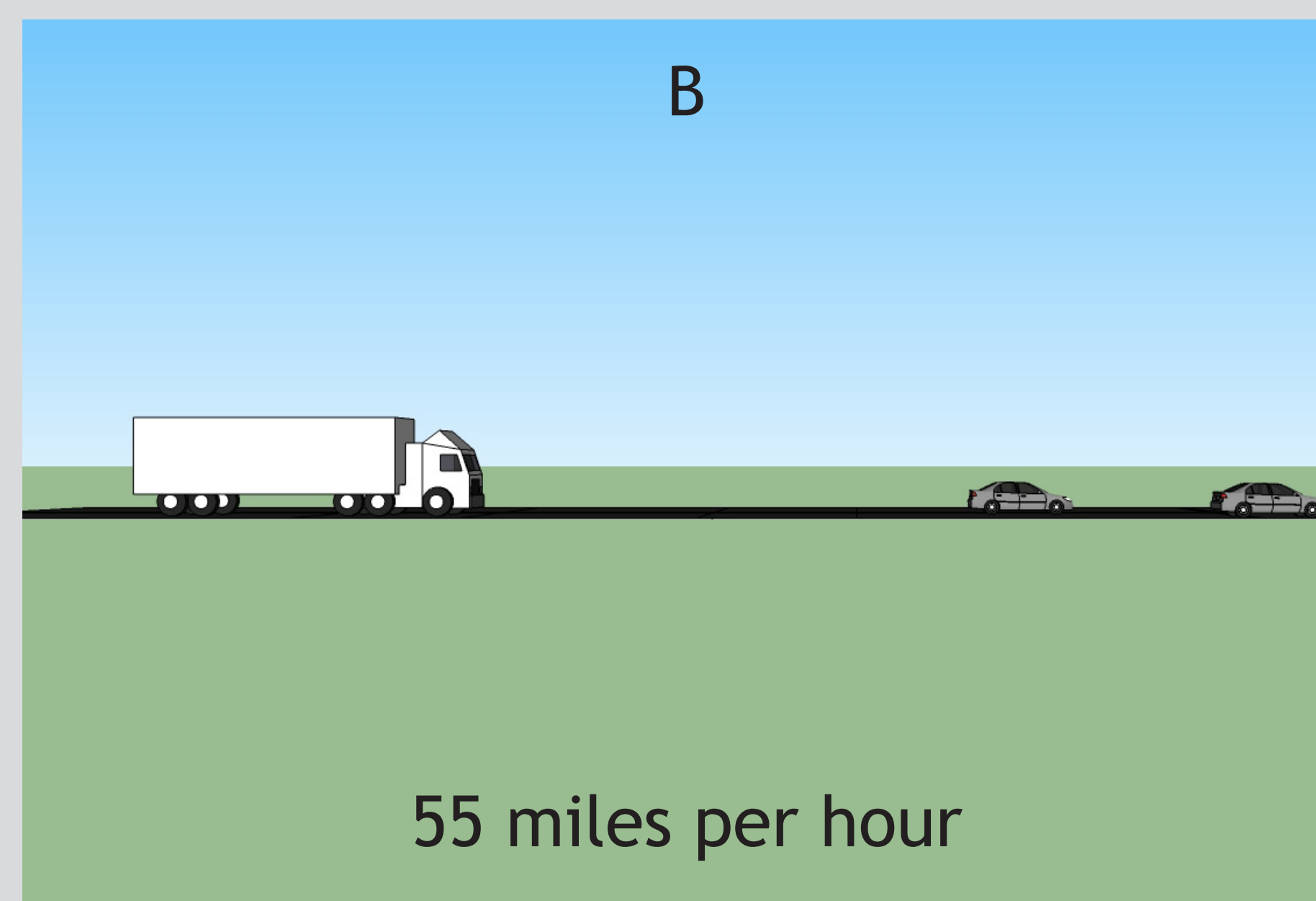
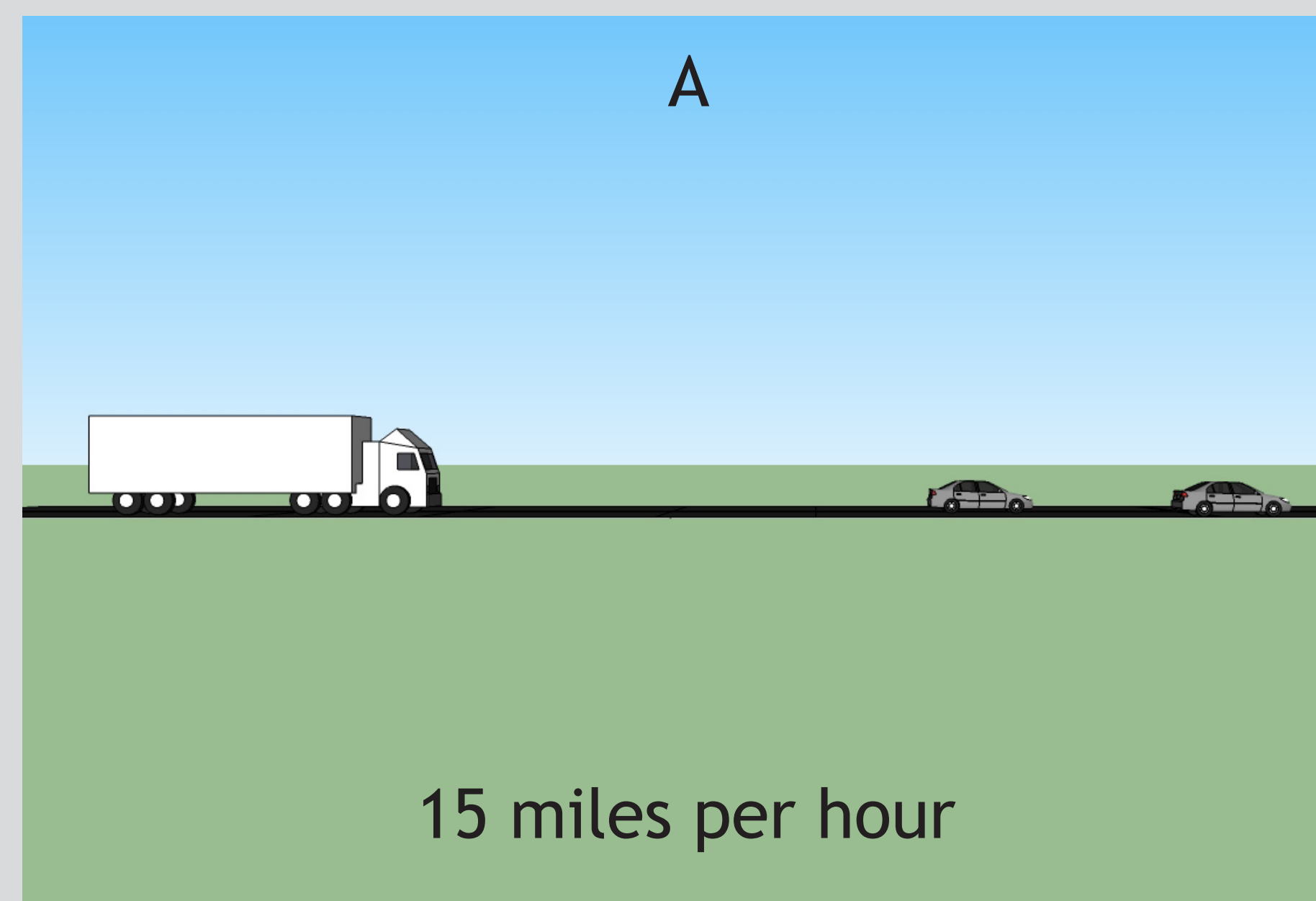
Causes of Traffic Noise

How Traffic Volume Affects Noise



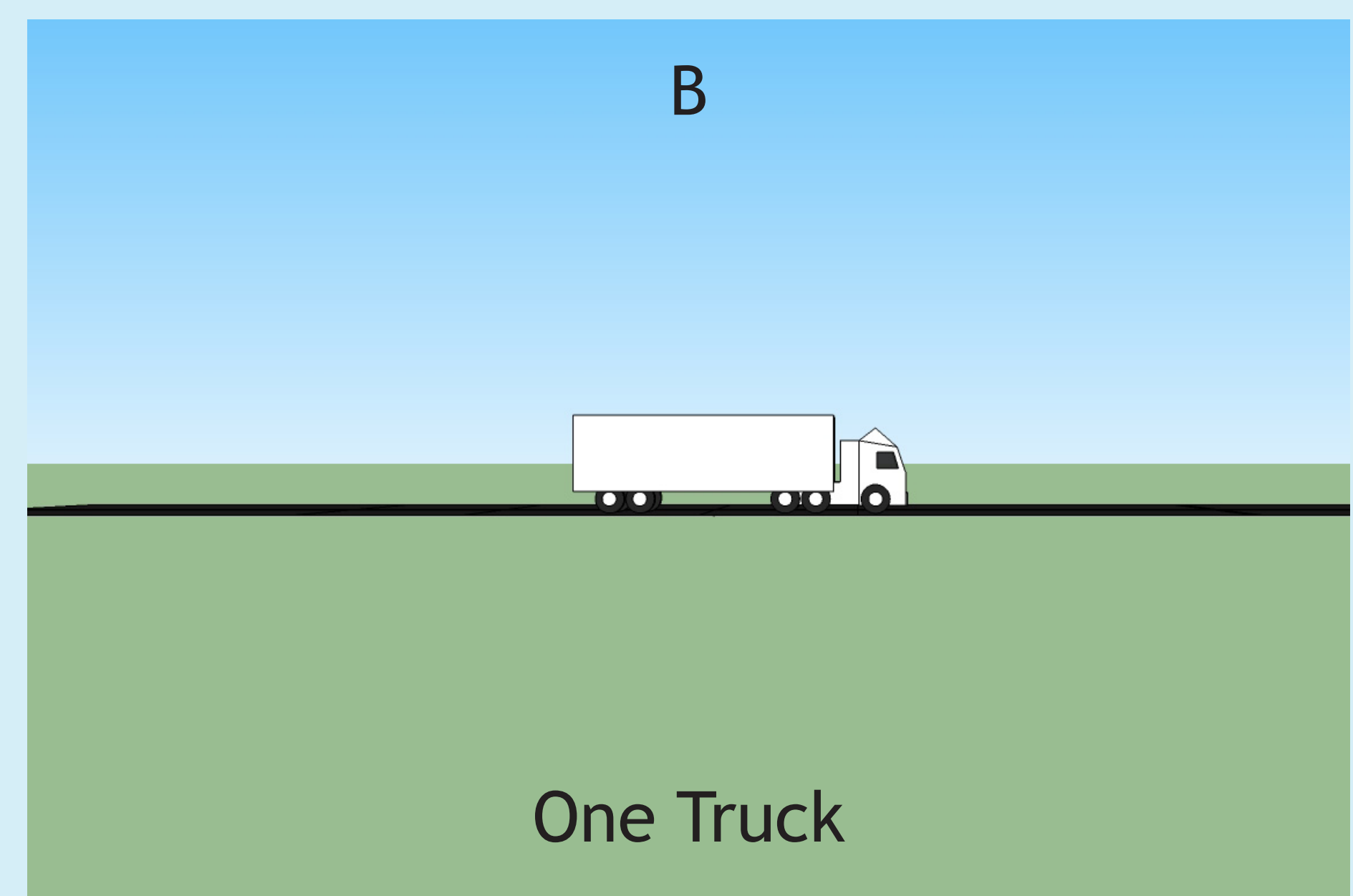
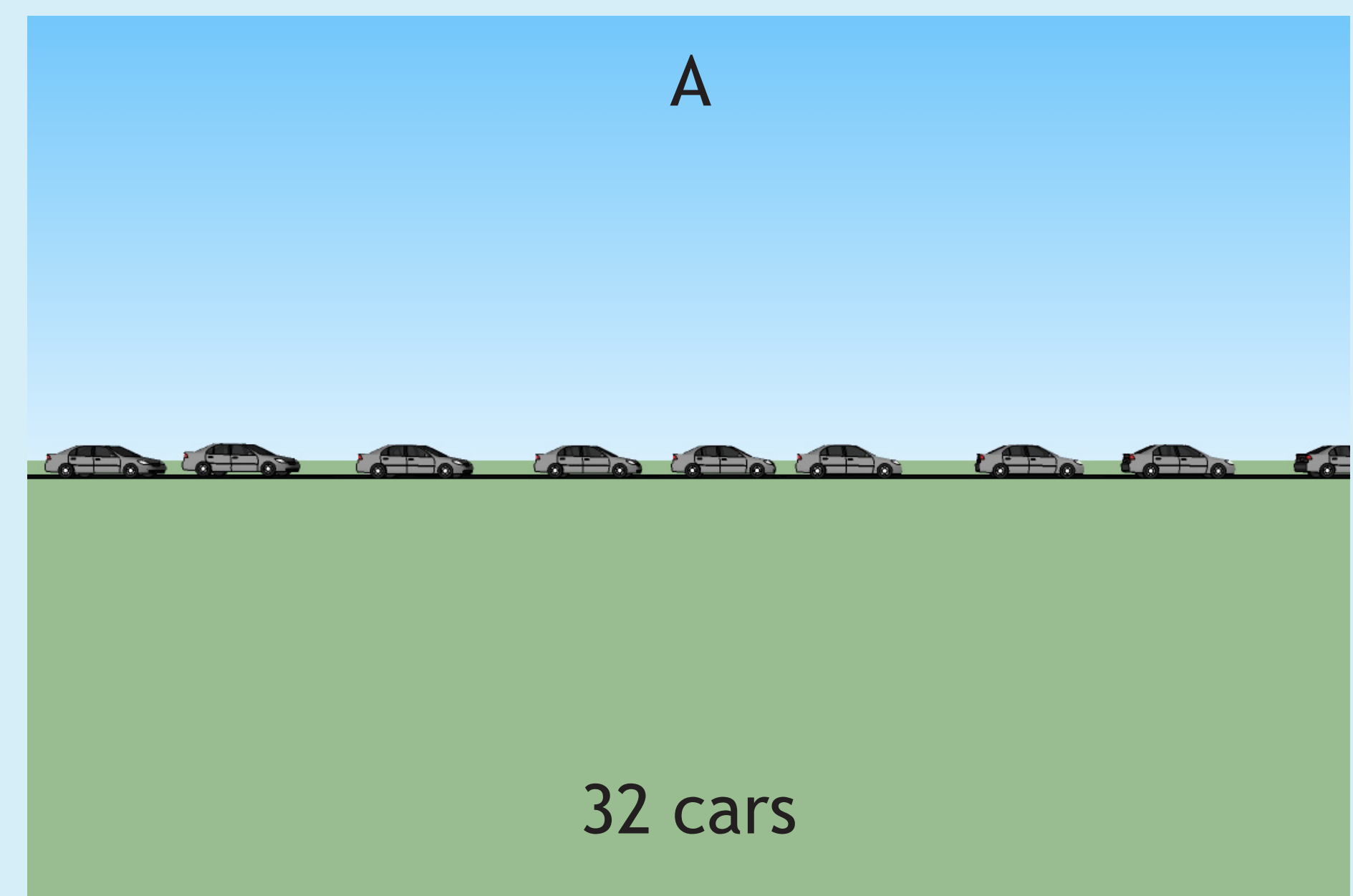
A sounds half as loud as B

How Speed Affects Traffic Noise



A sounds half as loud as B

How Trucks Affect Traffic Noise



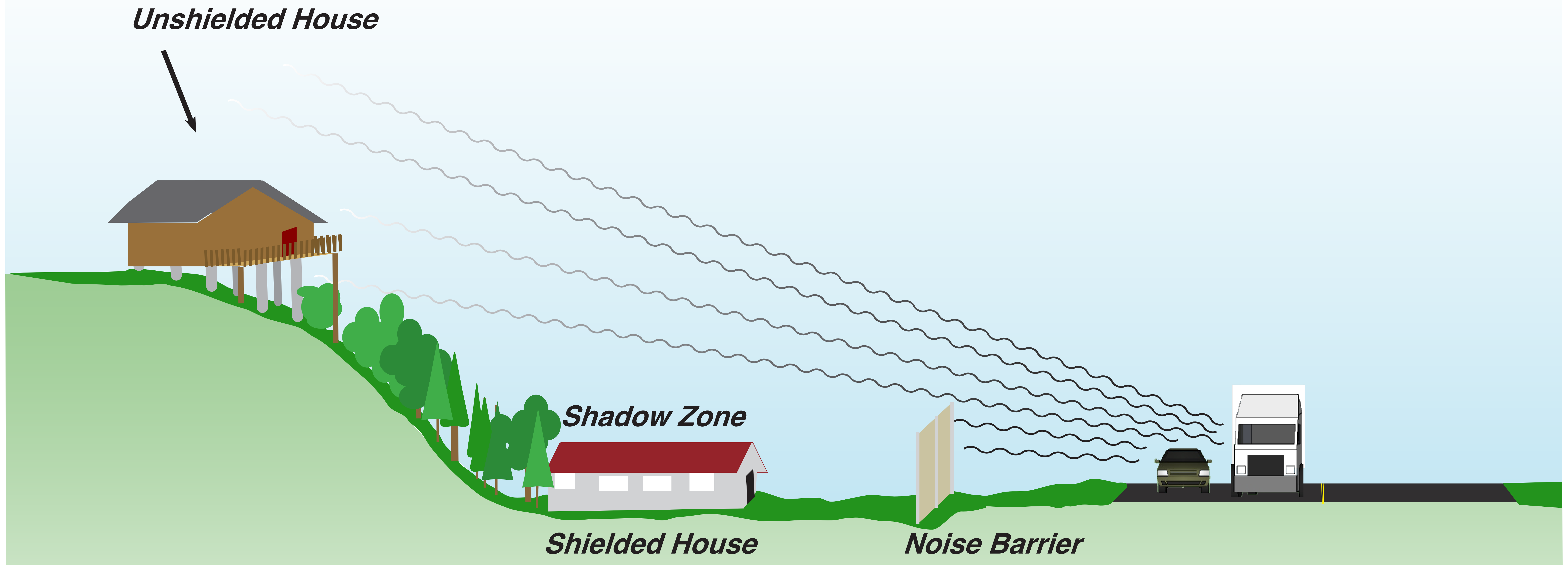
A sounds as loud as B

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



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Noise Barrier Effect



Shadow Effect of Noise Barrier

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

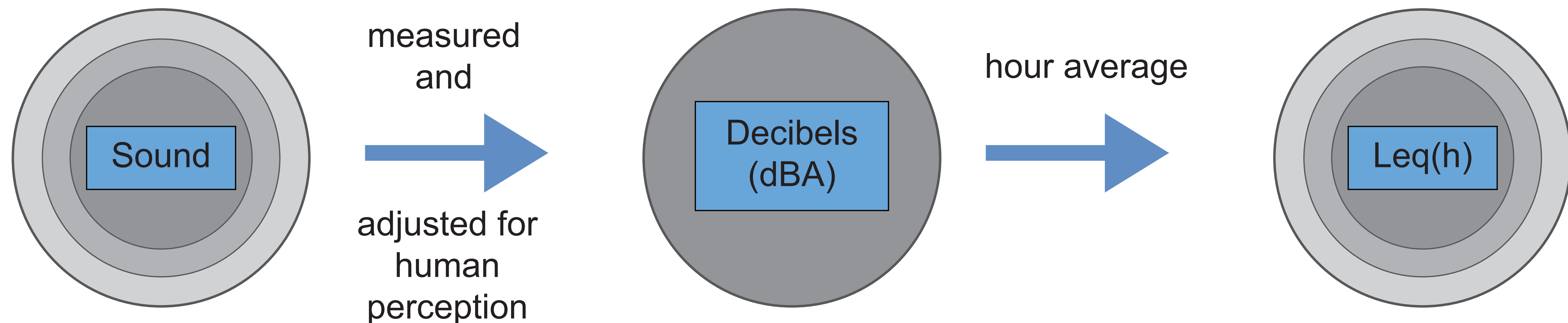
Source: VHB, based on *Highway Traffic Noise Analysis And Abatement Policy And Guidance*, U.S. Department of Transportation, Federal Highway Administration, Office of Environment and Planning, Noise and Air Quality Branch, Washington, D.C. June 1995



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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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