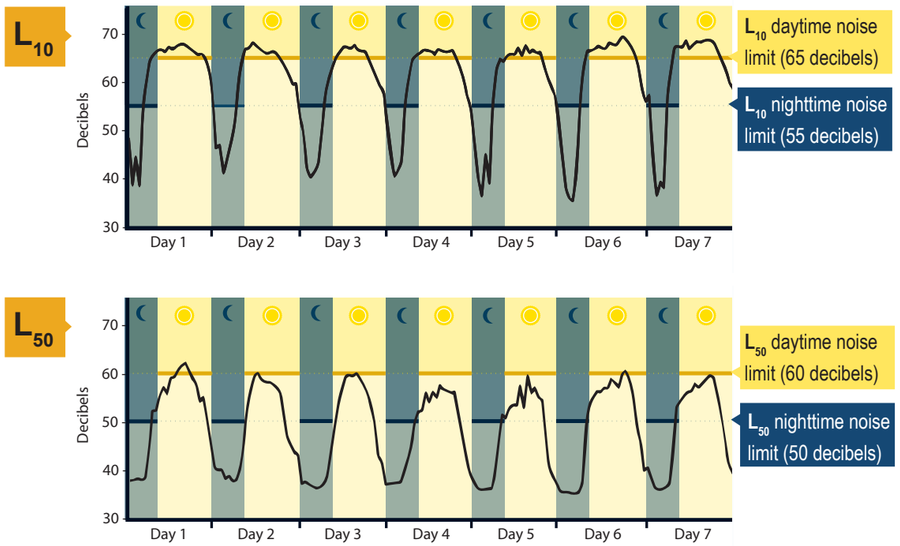
Hwy 61 Noise Study Results

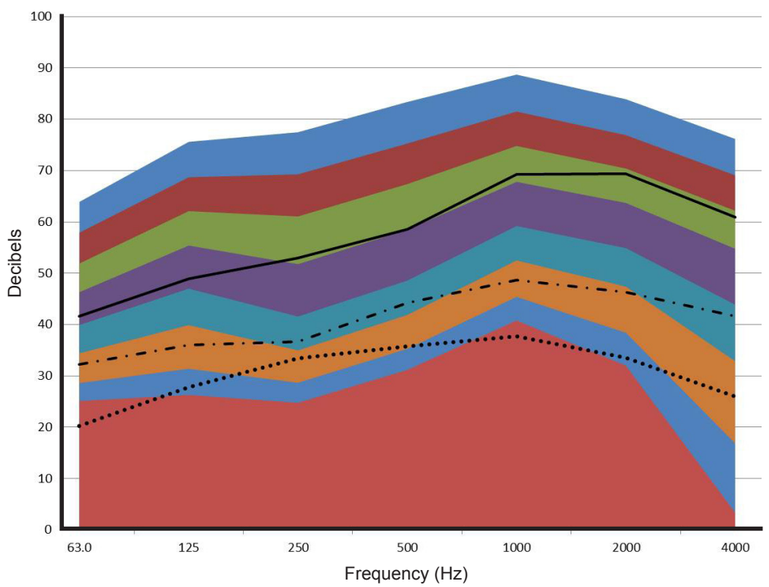
What do these results mean?

Noise from traffic driving on rumble strips is distinctly different from typical traffic noise. The results from the long-term measurements show that rumble strip noise is not causing a substantial increase in the L_{10} and L_{50} values.

Hourly L_{10} and L_{50} at a residence 60 feet from Hwy 61



Hwy 61 Rumble Strip Noise Levels



Modeled Rumble Strip Noise (single rumble-strip event)

Level	Distance from Hwy 61
	25 ft.
	50 ft.
	100 ft.
	200 ft.
	500 ft.
	1000 ft.
	2000 ft.
	3000 ft.

These modeled noise levels each illustrate a single rumble strip event at varying distances. They are based upon actual Hwy 61 noise data.

Individual Vehicle Noise (with no rumble strip events)

Level	Distance from Hwy 61
	50 ft.

Represents a single vehicle driving at 55 MPH on Hwy 61 with no rumble strip events.

Total Noise (with intermittent rumble strip events)

Level	Distance from Hwy 61
	130 ft.
	900 ft.

These levels represent the total average noise measured at residences, including background and traffic noise, and occasional rumble strip events.

Have questions? Contact the project team:

Primary contact: Bradley Estochen, Traffic Safety Engineer (Minnesota Department of Transportation)

Email: bradley.estochen@state.mn.us | **Phone**: (651) 234-7011 **Toward Zero Deaths:** www.minnesotatzd.org

To view the full report: www.dot.state.mn.us/trafficeng/safety/rumble/techreportfinal.pdf

SAVING LIVES BY KEEPING DRIVERS FOCUSED

Highway 61 Rumble Strip Noise Study

On Hwy 61 from Two Harbors to the Canadian border from 1986 - 2011

25 PEOPLE WERE KILLED IN HEAD-ON CRASHES

this averages out to **one person killed per YEAR**

What is a rumble strip?

Rumble Strips are indentations in the road surface – usually on the shoulders or along the centerline – that cause noise and vibration when a vehicle drives over them.

Drivers who are:

- *distracted*
- *tired*
- *speeding*
- *inexperienced*

can unintentionally drift over the centerline and cause crashes.

How do rumble strips help?

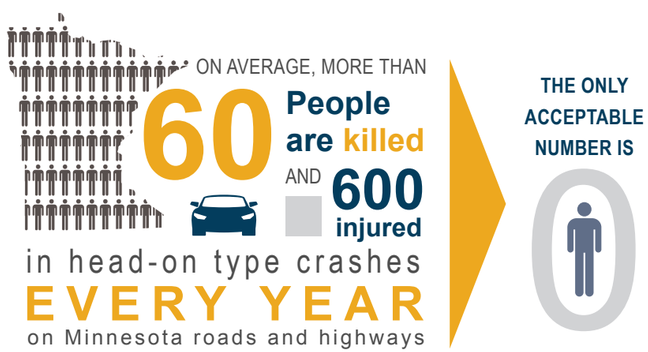
The "rumble" alerts motorists that are straying from the travel lane, prompting them to correct their steering and stay in their lane or on the road. Centerline rumble strips reduce crashes significantly:

- **9%** Total Crashes
- **12%** Fatal & Injury Crashes
- **39%** Total Head-On Crashes
- **44%** Fatal & Injury Head-On Crashes

Based on multi-state data from NCHRP Report 641, 2009.

"Toward Zero Deaths" Initiative

The Toward Zero Deaths (TZD) approach is based on the belief that even one traffic-related death on our roads is unacceptable. The MnDOT TZD mission of zero traffic fatalities has identified centerline rumbles as an effective way to reduce crashes.



Hwy 61 Rumble Strips

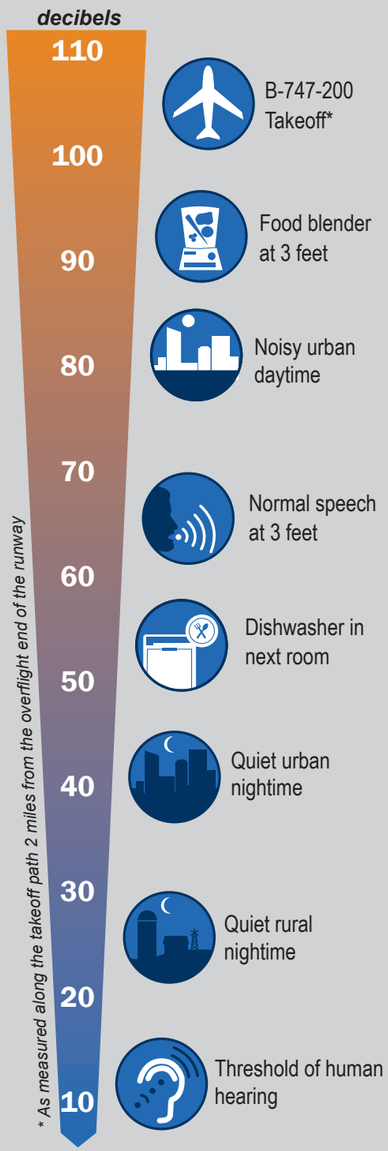
Some may find the intermittent noise made when a car drives on a rumble strip annoying. However, that same noise may prevent injury or save a life.

While our primary objective is the safety of drivers and passengers on Minnesota roadways, MnDOT takes concerns about noise impacts seriously.

To evaluate the noise impacts made by the centerline rumble strips on communities along Hwy 61 from Two Harbors to the Canadian border, MnDOT hired traffic noise experts at HDR Engineering Inc. to monitor, measure, and analyze the noise made by traffic passing over rumble strips.

How do we measure and regulate noise?

COMPARISON OF NOISE LEVELS



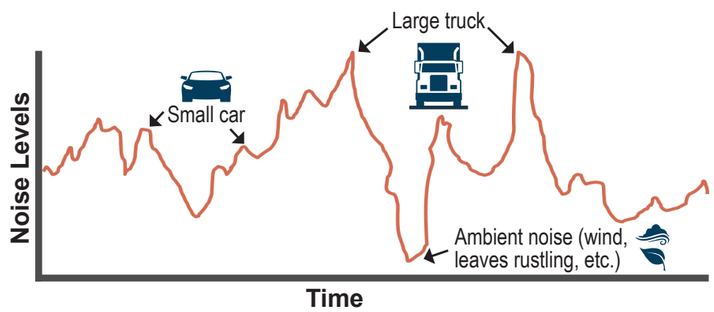
<3 decibels	Changes in noise levels of less than 3 decibels are not typically detectable by the average human ear.
+5 decibels	An increase of 5 decibels is generally noticeable by anyone.
+10 decibels	A 10-decibel increase is usually felt to be "twice as loud"

How do we measure noise?

The human range of hearing extends from approximately 3 -140 decibels. The scale to the left shows various noise levels in a real-world context.

Noise levels in outdoor areas can fluctuate widely over time. Noise experts use mathematical models to analyze the noise level data that they gather. These analyses account for noise level variations due to factors like ambient noise, the distance traveled by the noise, multiple noise sources, atmospheric conditions, etc.

The example graph below shows how monitored noise levels can vary substantially in an outdoor setting.



How is noise regulated?

Because outdoor noise levels can fluctuate widely, the Minnesota Pollution Control Agency uses two noise metrics to set limits on outdoor noise levels: L_{10} and L_{50}.

L_{10} represents the noise level exceeded for 10% of the hour (*i.e., noise levels can't exceed 65 decibels for more than 6 minutes of any hour during the day, or 55 decibels at night*).

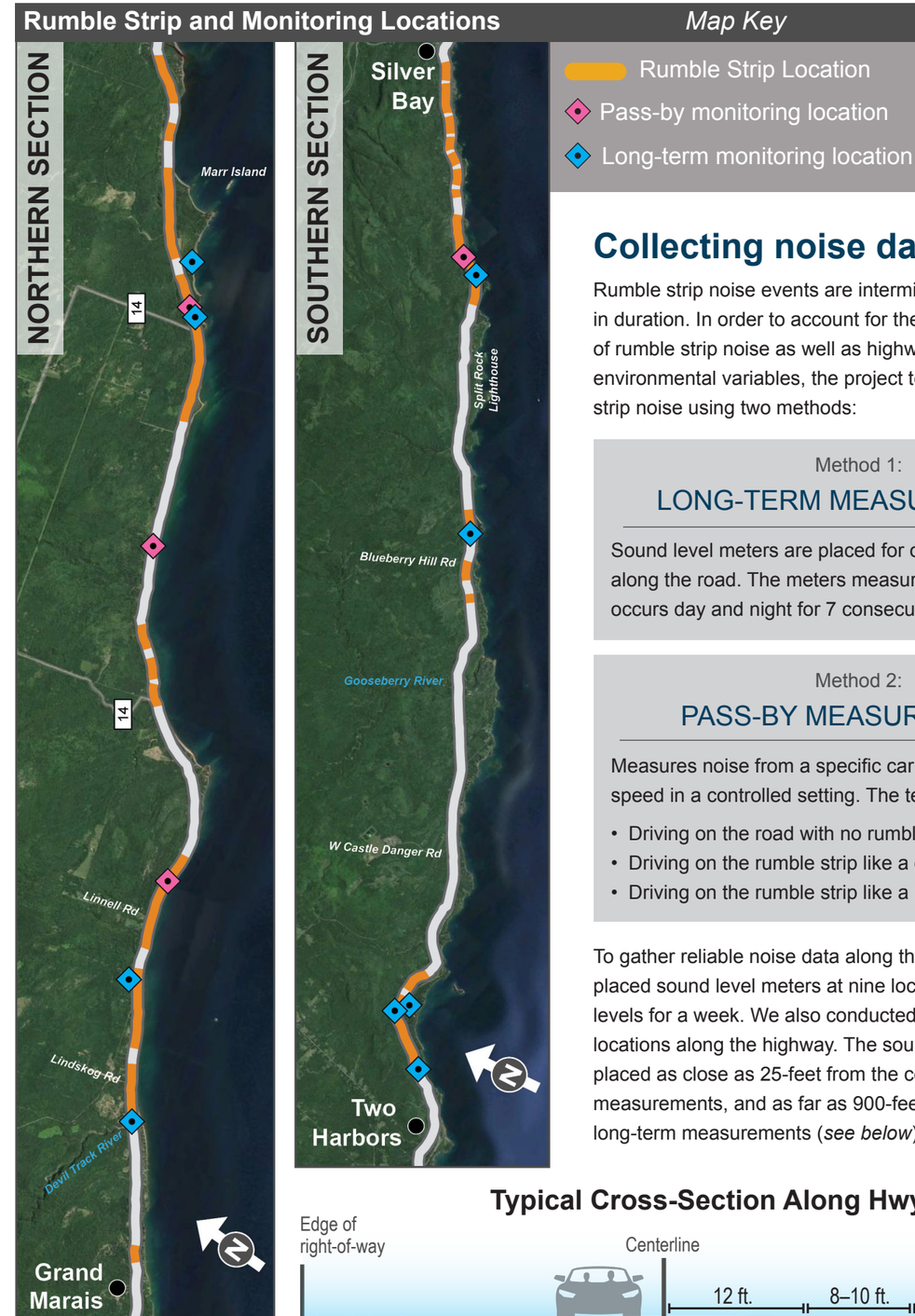
L_{50} represents the noise level exceeded for 50% of the hour (*i.e., noise levels can't exceed 60 decibels for more than 30 minutes of any hour during the day, or 50 decibels at night*).

Noise Limits for Residential Land Uses

Time of Day	L_{10}	L_{50}
DAYTIME (7am – 10pm)	65 decibels	60 decibels
NIGHTTIME (10pm – 7am)	55 decibels	50 decibels

Source: Minnesota Pollution Control Agency (MPCA). 2008. A Guide to Noise Control in Minnesota: Acoustical Properties, Measurement, Analysis, and Regulation.

How do we measure rumble strip noise?



Collecting noise data

Rumble strip noise events are intermittent and short in duration. In order to account for the sporadic nature of rumble strip noise as well as highway noise and environmental variables, the project team measured rumble strip noise using two methods:

Method 1:

LONG-TERM MEASUREMENTS

Sound level meters are placed for one week at a location along the road. The meters measure all sound that occurs day and night for 7 consecutive days.

Method 2:

PASS-BY MEASUREMENTS

Measures noise from a specific car driving at a known speed in a controlled setting. The test measures the car:

- Driving on the road with no rumble strips
- Driving on the rumble strip like a drifting car would
- Driving on the rumble strip like a passing car would

To gather reliable noise data along the Hwy 61 corridor, we placed sound level meters at nine locations to measure noise levels for a week. We also conducted pass-by tests at four locations along the highway. The sound level meters were placed as close as 25-feet from the centerline for the pass-by measurements, and as far as 900-feet from Hwy 61 for the long-term measurements (*see below*).

Typical Cross-Section Along Hwy 61