WSDOT Department of Mechanical Engineering

February 2026

Subject: Report regarding reducing noise impacts from the SR 520 bridge expansion joints

Dear House and Senate Transportation Committees,

This report summarizes the efforts to date by the University of Washington and the Washington State Department of Transportation to study expansion joint noise reduction measures on the State Route 520 floating bridge as directed by the 2025 Transportation Budget, ESSB 5161, Section 219 (9).

SR 520 Bridge Replacement and HOV Program overview

The SR 520 Bridge Replacement and HOV Program represents one of the largest transportation infrastructure projects in the Puget Sound region. The 12.8-mile-long SR 520 corridor extends from SR 202 in Redmond to I-5 in Seattle. It provides a vital social and commercial transportation link between Seattle and the growing, economically vibrant cities on the east side of Lake Washington.

History of expansion joint noise mitigation efforts on SR 520 floating bridge

The new SR 520 floating bridge opened to traffic in April 2016. Soon after, some lakeside residents expressed concerns about noise from vehicles driving across metal expansion joints. These joints are located on the highway's east and west high-rises. In response, WSDOT committed to working with the community and the expansion joint manufacturer to explore noise-reduction options.

WSDOT and a University of Washington engineering team later conducted noise studies on the new bridge. They found that overall noise levels from the new bridge's joints were lower than those of other bridges in the area, including the I-90 floating bridge, the Tacoma Narrows Bridge and the old SR 520 bridge. They concluded that the new bridge's quieter, specially grooved pavement reduced the noise from vehicle tires on the roadway. Quieter pavement, they found, made the noise from cars running over the new expansion joints seem more pronounced. This happened even though the new joints' noise level was actually lower than the old bridge.

The Legislature directed WSDOT and the UW team to field test potential options for reducing the floating bridge's expansion joint noise. The field study investigated the design and feasibility of noise mitigation strategies for installation in modular expansion joints. Researchers filled the modular expansion joints with chevron-shaped foam inserts for a duration of two months. Installation of the treatment on one westbound lane of the east expansion of the SR 520 bridge proved to be effective in reducing audible noise over the two-month test period.

While research showed that the chevron system could be an effective solution to the expansion joint noise issue, the study outlined further development and testing to extend the durability of the treatment so it would be feasible to install and maintain with minimized safety risks and impacts to the traveling public (deemed Phase III). Separate funding would be required to implement any bridge changes recommended by the new study.

2025 legislative proviso

In 2025, the final transportation budget included a $657,000 legislative proviso to advance the Phase III durability study to reduce noise impacts from the SR 520 bridge expansion joint. The proviso stipulated that "field testing shall be scheduled during existing construction, maintenance, or other scheduled closures to minimize impacts. The testing must also ensure safety of the traveling public. The study shall examine the types and durability of the materials used to provide noise mitigation and the costs associated with the differing types of materials."

The proviso requires a draft report to the Legislature and governor by March 1, 2026, and a final report by December 31, 2026.

Safety and technical concerns

Following passage of the proviso, WSDOT identified several safety concerns related to the long-term installation of the material without data demonstrating how the material would perform under a high range of joint movement and resulting forces. The existing SR 520 floating bridge expansion joints are designed to withstand severe weather events. Installing a material without a sound and reliable proof of concept could jeopardize both public safety and the performance and condition of the modular expansion joint. The ability of the material to remain securely within the joint, avoid dislodgement into traffic and maintain proper joint function has not been demonstrated.

In addition, WSDOT identified several technical concerns related to implementation feasibility:

- **Cost**: The Phase III budget proposal submitted by the University of Washington for the field study exceeded the allocated proviso amount by more than $100,000. Additional unaccounted-for costs for WSDOT included potential traffic control, loss of toll revenue and staff time required to support the effort.
- **Proposal schedule:** The University of Washington's Phase III field test proposal included a 30-month testing period to evaluate material durability over time. The timeframe specified in the proviso reduced the study duration by more than half, thereby compromising the ability to meet the stated objective of assessing long-term durability.
- **Closure schedule:** The proviso required field testing to occur during existing SR 520 closures. However, the SR 520 Program has only one remaining planned floating bridge closure, which is scheduled to occur after the proposed study timeframe.

To address public safety concerns, mitigate the risk of joint damage and resolve technical implementation issues, WSDOT and the University of Washington revised the proposal to include an initial phase of laboratory testing.

Revised Phase III Study

Overview:

Develop and perform laboratory-based testing of a highly durable sound attenuation system based on the system developed in WSDOT Modular Bridge Expansion Joints - Phase 2. These activities will be performed concurrently.

- Injection molding of sound mitigation prototypes using a mixture of fiber-reinforced, natural and synthetic rubber with protective additives. (~6 months)
- Selection of low-density foam to fill prototype gaps for increased treatment durability and protection against roadway debris. (~2 months)
- Safety and durability evaluation of the prototype systems using laboratory testing equipment. (~8 months)

Key laboratory tests include:

1) Hydraulic compression testing to test loading forces
2) Cycle fatigue testing to test the lifespan of the material with repeated expansion and compression
3) Preliminary durability testing by simulating harsh environmental conditions
4) Adhesive durability testing by testing differing steel bonding conditions
5) Environmental testing to test conditions like dirt, gravel and debris
6) Abrasion testing followed by destructive tensile testing to evaluate resistance to wear

Progress to date

Progress on the lab study was delayed by three months due to a one-month delay in executing the research contract, combined with challenges in procuring materials. Despite the schedule delays, the research team has made progress on the following milestones:

- *Material selection:* The Phase II study used a cast urethane model; however, greater material durability is needed for the next iteration before testing can begin. Material requirements include a five-year lifetime, a durometer of 85-95A +, and avoiding known environmental hazards that would introduce additional environmental concerns to the existing bridge. The team has analyzed a list of potential materials that meet the necessary criteria. Five materials were analyzed according to the following characteristics: abrasion resistance, flexibility, weather resistance, chemical interactions and temperature.

- *Vendor selection:* Conversations with vendors on capabilities and material recommendations are in progress and currently include nine potential vendors.

- *Foam candidates:* Five potential foam candidates were analyzed based on the following characteristics: weather-resistance, compression, temperature and durability.

- *Test equipment:* The University of Washington has six testing machines available for a range of safety testing, with two additional test procedures under consideration. Initial testing will begin by defining the forces for the bridge during a catastrophic event that create an extreme change in water level and full closure of the expansion joint gaps. The rubber component will be designed so that it fails before the maximum allowed bridge forces are reached. This failure mode will either be a displacement (it will come out of the bridge joint before failure) or destruction (it will be destroyed before the bridge joint is at the minimum location). Weak points in the bridge component will be identified for consideration as failure points.

Schedule milestones

The research team will plan to keep the Washington State Department of Transportation and the Washington State Legislature apprised of progress via the following deliverables:

- First progress report, July 1, 2026
- Draft Final Report, December 31, 2026
- Final Report, March 1, 2027

For questions regarding this report, please contact Dawn Yankauskas, SR 520 Deputy Program Administrator, at dawn.yankauskas@wsdot.wa.gov.