



August 2022

TRAC e-News: Delivering Research Results!

The Washington State Transportation Center ([TRAC](#)), conducts transportation research through collaborative partnerships among WSDOT, the University of Washington (UW), and Washington State University (WSU).

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- Creating a planning support tool for transit-oriented development (TOD)
- WSDOT Webinar Wednesdays: upcoming and previous webinars

Environment

Extended molecular monitoring for Padden Creek



Research team: [Ryan Kelly](#) (UW) | [Tammy Schmidt](#) (WSDOT) | [Susan Kanzler](#) (WSDOT) | [Jon Peterson](#) (WSDOT)

Sponsor: WSDOT

Ongoing: This study is evaluating the ecological impacts of culvert replacements on Padden Creek near Bellingham, Wash. WSDOT began construction in April 2021 to replace two culverts that prevent fish passage along 2.7 miles of Padden Creek. A contractor is replacing an existing concrete box culvert at I-5 with two fish passable bridges and a double concrete box

culvert at SR 11 with a 20-foot single-span concrete box culvert. To evaluate the impacts of those replacements, UW researchers are sampling the water for DNA at Padden Creek and two control creeks through September 2022. They will develop molecular assays for several species that are a priority for WSDOT by using CRISPR-Cas12a technology. They hope to hand off these assays to WSDOT and other state agencies so that they may autonomously use these techniques for evaluating these and other waterways. [Read more...](#)

Freight

Truck Parking Information and Management System

Research team: [Yinhai Wang](#) (UW) | [Karthik Murthy](#) (WSDOT) | [Doug Brodin](#) (WSDOT)
Sponsor: WSDOT

Ongoing: To help commercial drivers plan their trips and maximize the use of available parking, WSDOT, in partnership with the STAR Lab at the University of Washington, is developing and installing a self-learning and optimizing Truck Parking Information and Management System (TPIMS). The UW researchers will support WSDOT in determining site viability and design to prepare for TPIMS

development. They will build the server that will host all relevant data and UW analytics algorithms and will integrate it with WSDOT's data management system. They will enhance the accuracy and reliability of the truck parking availability prediction algorithm based on the results and findings from a pilot project. And they will work with WSDOT to develop an application programming interface (API) to give third parties access to the resulting occupancy and prediction data. [Read more...](#)



Geotechnical Engineering

Utility and limitations of using recycled asphalt pavement (RAP) as roadway embankments



Research team: [Haifang Wen](#) (WSU) | [Idil Akin](#) (WSU)
Sponsor: Illinois State Toll Highway Authority
[Report](#)

Completed: The use of recycled asphalt pavement (RAP) is a sustainable practice that potentially could help reduce construction costs, preserve the environment, and reduce greenhouse gas emissions, provided that the engineering performance of the roadways constructed with RAP is not compromised. This project sought to determine the limits for using

RAP as a roadway embankment material and to develop draft specifications for the required material and its placement. To do so, the research team procured RAP samples from five sources used by Illinois Tollway contractors, as well as two conventional soils, and conducted laboratory experiments that included testing for basic soil/RAP characteristics, gradations, moisture-density relationships at different temperatures, permeability, and drainage. They also included one-dimensional consolidation tests, dynamic triaxial tests, and settlement analysis. [Read more...](#)

Maintenance

Design of living barriers to reduce the impacts of snowdrifts on Illinois freeways

Research team: [Xianming Shi](#) (WSU) | John Petrie (WSU)

Sponsors: Illinois Center for Transportation | Illinois Department of Transportation

[Report](#)

Completed: Blowing snow accounts for a large part of the Illinois Department of Transportation's total winter maintenance expenditures. This project developed recommendations for the design and placement of living snow fences (LSFs) to minimize snowdrift on Illinois highways. The research team developed a computational fluid dynamics model to numerically simulate snow drifting around LSFs. This was followed by field testing of selected LSFs along the Illinois highway system. The resulting guidelines are for siting LSFs on terrain that is flat or mildly sloped. Guidance is provided for determining fence setback, wind characteristics, fence orientation, and fence height and porosity. For sites with steeper embankments, guidelines include a fence at the base and one or more fences on the embankment. More effective and efficient snow and ice control operations could produce significant economic, environmental, and social benefits. [Read more...](#)



Snow and ice treatment products evaluation



Research team: [Xianming Shi](#) (WSU)

Sponsor: Missouri Department of Transportation

[Report](#)

Completed: The Missouri Department of Transportation uses different materials to reduce the impacts of snow and ice on state roadways. In addition to plowing, the use of chemicals and abrasives for highway winter maintenance operations is essential for ensuring a reasonably high level of service, yet the performance of such

materials has to be balanced with their cost effectiveness and potentially detrimental effects on infrastructure, the natural environment, and motor vehicles. This project addressed information gaps related to the performance and impacts of these materials. The researchers studied the effective operational temperature ranges of designated products, any impacts of the products on bridges and pavements, the performance characteristics of the products, and the cost effectiveness of various solid and liquid anti-icing and de-icing agents. The research team also developed an evaluation matrix to assess the materials' cost-effectiveness and potential impacts to infrastructure, motor vehicles, and water bodies. [Read more...](#)

Transportation Planning

Assessment of potential investments needed to deliver electricity for electric aviation at Paine Field and Grant County International Airport

Research team: [Don Mackenzie](#) (UW) | [John MacArthur](#) (WSDOT) | [Jon Peterson](#) (WSDOT)

Sponsor: WSDOT

Ongoing: Aviation is evolving to electric propulsion. However, the electricity requirements, even to charge a small commercial airplane, are substantial, and the likely emergence of electric Vertical Take-Off and Landing (eVTOL) air taxis will create a significant demand for electricity at airports.



WSDOT understands that to meet the needs of both air travelers and shippers, the state must determine what investments in new electric capacity will be required to support electric aviation. This study will examine the existing electrical capacity and potential future demand at the Grant County International Airport and Snohomish County Paine Field. Tasks will include understanding current and planned electrical capability and capacity at the two airports, identifying options for on-site power generation, and recommending strategies to expand and improve electrical capacity at each site. [Read more...](#)

Transit-oriented development screening tool



Research team: [Qing Shen](#) (UW) | [Arthur Acolin](#) (UW) | [Anne Vernez Moudon](#) (UW) | [Anthony Buckley](#) (WSDOT) | [Doug Brodin](#) (WSDOT)

Sponsor: WSDOT

Ongoing: There is growing public interest in implementing transit-oriented development (TOD) where it is appropriate and cost-effective. TOD can be leveraged to support state and local government policies intended to reduce vehicle miles traveled and the expansion of parking facilities that contribute to increased congestion. WSDOT is uniquely positioned to effectively catalyze TOD in

the state of Washington. This project is aimed at developing and testing an effective planning support tool that will help WSDOT identify the promising sites—specifically park and ride facilities—on which to focus its TOD efforts. To develop a sophisticated prioritization screening tool to examine the potential for TOD in transit station areas, the project team will consider a range of location characteristics, socioeconomic indicators, and policy measures. The project could help effectively target scarce resources and serve as a model for other states to follow. [Read more...](#)

Webinar Wednesdays

WSDOT's [Research & Library Services Office](#) hosts *Webinar Wednesdays*, a series of bimonthly, one-hour webinars. Each webinar showcases a research project whose results could eventually be implemented statewide. [Previous webinars are available for access here.](#)

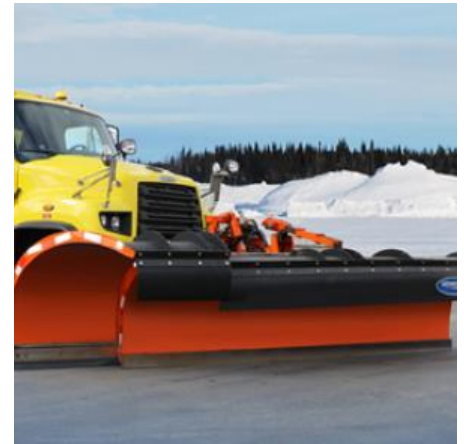
Below is information about upcoming and recent research webinars:

Innovating on the job: WSDOT's extendable front snowplow – August 24, 2022 (10:30-11:30 AM PDT)

To register (free): <https://register.gotowebinar.com/register/604208452319158539>

Presenter: James Morin, WSDOT Maintenance Operations Branch Manager

This webinar will focus on a grassroots innovation from frontline maintenance workers in WSDOT's Eastern Region. Learn about how the extendable plow came to be developed and some preliminary findings on how it has been working in the field. Winner of this year's Maintenance and Operations Innovation Challenge at WSDOT, the plow extends beyond the length of a standard snowplow while "on the fly" to do the same work as a wing plow, and it is easily retracted when drivers approach bridges or narrow shoulders.



Stream simulation culvert beds (June)

[Access the recording](#)



Presenters: [Julie Heilman](#), WSDOT State Hydraulics Engineer | [Tyler Fouty](#), WSU PhD student | [Nicholas Engdahl](#), WSU Associate Professor of Civil and Environmental Engineering

Historically, stream simulation culverts have been designed with use of coarse bands for the bed stability. The hope has been that the bed would remain dynamic and adjust naturally over time, but guidance on specifically how to arrange the material to achieve this goal has been sparse.

The objective of this research was to establish design

guidance for the best use of coarse bands to maintain channel shape—for longer than streambeds without coarse bands—without completely restricting sediment motion.

TRAC e-News will be delivered about three times a year. For more information about TRAC and the ground-breaking work we are doing, please visit our [Current Projects](#) and [Research News](#) pages. A downloadable, pdf version of [this newsletter](#) is also available.

For contact information, follow these links:

- [WSDOT Contacts](#)

- [UW Contacts](#)
- [WSU Contacts](#)

The Washington State Transportation Center (TRAC) is a cooperative, interdisciplinary transportation research agency. Its members, the Washington State Department of Transportation (WSDOT), Washington State University (WSU), and the University of Washington (UW), formed TRAC in 1983 to coordinate transportation research efforts—both state and commercial, public and private—and to develop research opportunities both nationally and locally. TRAC acts as a link among government agencies, university researchers, and the private sector.

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